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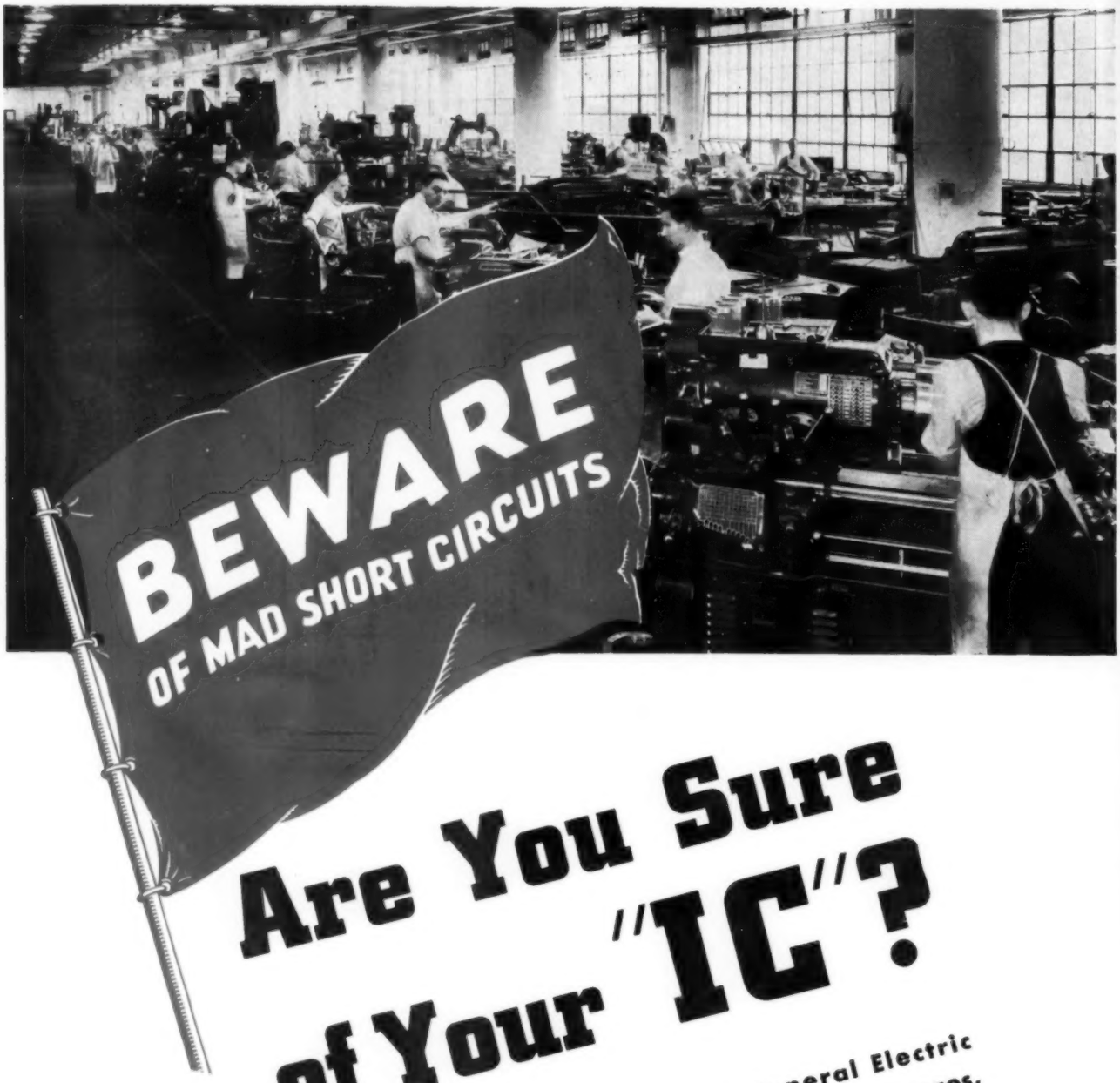
ENGINEERING INDUSTRIES



Are You Sure of Your "IC"?

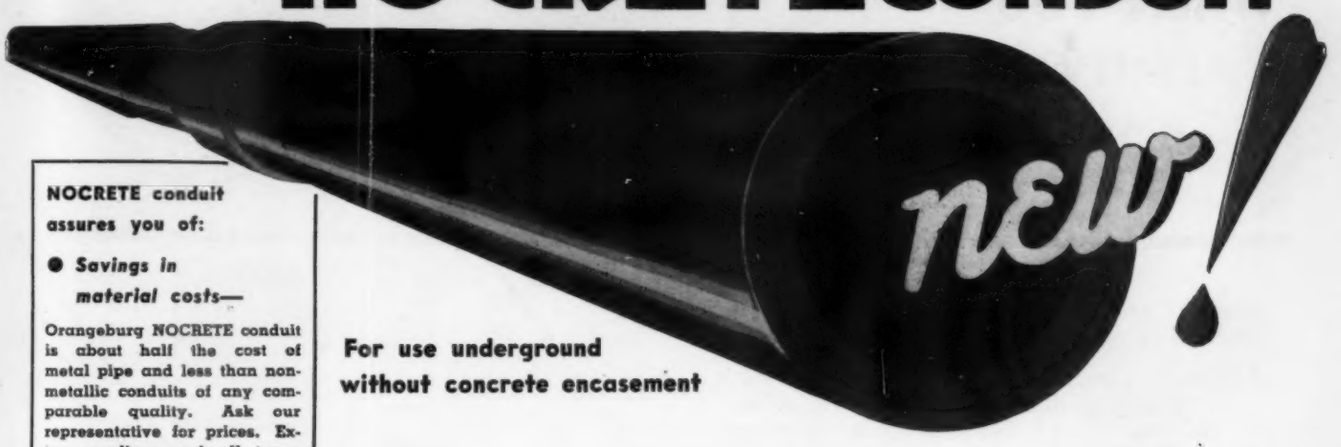
BEGINNING next month, the General Electric Company will bring you, in these advertising pages, a series of messages on a vital problem in industry. They will explain the importance of a clear understanding of "I C," its relation to the safety of your personnel and equipment—and the solution of this problem.

GENERAL ELECTRIC

890-82

There's a profit in every foot

ORANGEBURG NOCRETE *the new Dual Economy* CONDUIT



For use underground without concrete encasement

NOCRETE conduit assures you of:

- ***Savings in material costs—***

Orangeburg NOCRETE conduit is about half the cost of metal pipe and less than non-metallic conduits of any comparable quality. Ask our representative for prices. Extra couplings and all types of fittings, ells, bends, etc., are available.

- ***Savings in installation costs—***

it "handles easy"; light in weight, in handy 5 or 8 foot lengths (in various sizes), this super-sturdy duct will surprise you by its adaptability. It assembles and installs easier, faster and at a lower cost than any conduit you have ever used. It is readily cut and fitted with ordinary wood-working tools.

There is a fully-informed NOCRETE representative no farther than your telephone. The nearest branch of either the General Electric Supply Corp. or The Graybar Electric Co. is at your service, ready to give you full information about this conduit—or to take your order for any amount from a length to a train-load.

If you get full details today, you can adapt Orangeburg NOCRETE Conduit to all your underground jobs and assure yourself of the profit that awaits you every time you use it.

Write today for complete information. Ask for Bulletin ECDM.

THE FIBRE CONDUIT COMPANY

Sales Office: 292 Madison Ave. New York

Factory: Orangeburg New York

Sales Agent—Distributors:
The Graybar Electric Co.
General Electric Supply Corp.

ORANGEBURG

WHAT DO YOU SEE

WHEN YOU REMOVE THE COVER?

Branch Circuit Cabinets and Panelboards may look pretty much alike outside . . . but how about inside?

Electrical Contractors agree that Wadsworth builds mighty good Branch Circuit Cabinets and Panelboards. They likewise agree that such Wadsworth Devices are easy to handle and quickly installed.

Here are some things Contractors like about Wadsworth:

Trim and dead front are entirely separate, consequently it is not necessary to adjust block for variation in plaster.

In 8 circuit cabinets and above, fuse block supports are slotted providing easy removal of fuse block for quick wiring.

Entire fuse block is molded Bakelite construction . . . it's light—durable —good looking.

Cabinets have ample wiring space and plenty of knockouts.

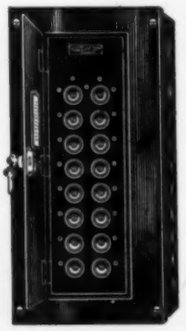
Made in Surface and Flush types with and without provision for toggle switches.

Sizes—2 to 24 circuits.

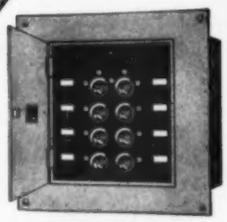
You pay no more for WADSWORTH'S *Extra Quality!*

No. 6C5
Branch Circuit Cabinet
Surface Mounting Type

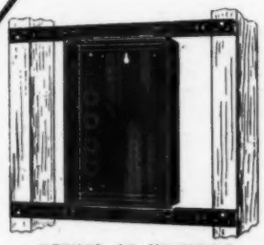
No. 8FN
Branch Circuit Cabinet
Flush Mounting Type



No. 16BN
Panelboard
Surface Mounting Type



No. N8FTN
Branch Circuit Cabinet
Arranged for Toggle Switches
Flush Mounting Type



METHOD OF MOUNTING

On Flush Type 8 circuit and above we supply supports for mounting to studding which are easily attached as shown above.

Flush type cabinets up to 6 circuit inclusive, are provided with angle braces on side of cabinet for attaching to studding.

"THE PROFIT LINE FOR 39"

BUY WISELY . . . BUY WADSWORTH!

See Your Electrical Wholesaler

The WADSWORTH ELECTRIC MFG Co. INC.

Covington, Kentucky.

electrical contracting

With which is consolidated The Electragist and Electrical Record
Established 1901

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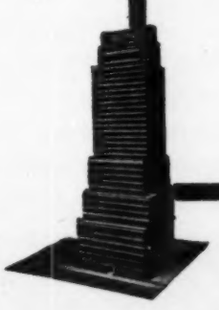

A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.

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FACTS about the model wiring job of Westinghouse Dairy Electrical Proving Farm, Webster, N.Y.

1. **Cable chosen throughout was Anaconda Durax Non-Metallic Sheathed Cable.**
2. **No wire less than No. 12 was used.**

Even the way Durax is packed is an improvement. Just break out center "bull's-eye" and cable comes out as wanted.

EASY ...the rip cord in Anaconda Durax makes opening outer covering easy. A work-saver you'll appreciate.

SPEEDY ...the extra-heavy, triple weight outer sheath is pulled back *double quick!* No waste motion here!

SIMPLE ...pull off the paper tape. Code rubber compound comes away easily from copper conductors.

Write for this FREE Booklet!

A sound choice it was...this selection of Anaconda Durax for the model farm wiring job of Westinghouse Electric & Mfg. Company at Webster, N.Y. And the fact that No. 12 was the smallest wire used is a useful lesson in adequate wiring. The ease, speed and simplicity of installing which made Westinghouse select Durax Non-Metallic Sheathed Cable is the best reason why this cable will help the wholesaler and electrical contractor. Let us tell you all about it. Get this booklet. 38448

USE MODERN IMPROVED **Anaconda Wire & Cable**

ANACONDA WIRE & CABLE CO., General Offices: 25 Broadway, New York • Chicago Office: 20 N. Wacker Drive

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electrical contracting

FEBRUARY, 1939

Why Be Afraid?

OUT OF THE BLUE, the other day, came a post card. It bore no name. The signature was just *"A Wireman out of Work."* It read—

> "I enjoy your editorials, but why a lot of High Talk when to make this game good for the next 5 years get the local Inspection Bureaus to condemn all the violations. Go into any store or plant and there they are enough work for the next 5 years."

WELL, THE BEST ANSWER I KNOW is the classic phrase of Potash and Perlmutter—"Ain't it the truth!" Wiremen out of work, contractors needing jobs, wholesalers and manufacturers battling hard times—(Though now on the up! Praise God!)—and there is enough business waiting in every community to make us a boom. But we're afraid of it.

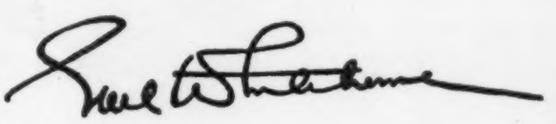
CLOTHING MANUFACTURERS don't hesitate to change styles and make all the poor women buy goofy new hats. The automobile industry is not afraid to redesign in a depression so everybody's car will look shabby. But electrical men somehow don't dare tell people when their wiring is not safe.

SIRED BY SCIENCE AND DAMNED BY ENGINEERING we electrical men from birth have lacked commercial courage. So it has always been unwritten law that we should not admit that electricity is dangerous, The mere mention of it gives a power company man the creeps. And we don't sell better wiring at these points.

OF COURSE, AUTOMOBILES KILL a hundred people every day. Smoking cigarettes causes countless fires. A friend of mine while out skiing recently tried to pass a small tree on both sides—and you know what. But who stops using or doing things they like? And who is going to be afraid of electricity?

OUR "WIREMAN-OUT-OF-WORK" FRIEND IS RIGHT. Our factories and stores and offices are full of fire and casualty hazards that the law empowers us to correct. Millions of our houses contain bathrooms where death lurks daily behind a socket or switch. *And we do nothing!*

ISN'T IT TIME WE WERE HONEST with ourselves and with the public? Electric wiring is now dangerous in too many places. We need a crusade to make it safe. Contractors can start it in every city—by frank selling and by demanding rapid reinspection. Why are we afraid?



"JUST A MINUTE MR. CONTRACTOR!

—THAT ISN'T ALL YOU GET."

When you do business with Graybar, you get more for your money than just the materials you buy. You get a dependable product for a fair price, of course . . .

But you get other things, too.

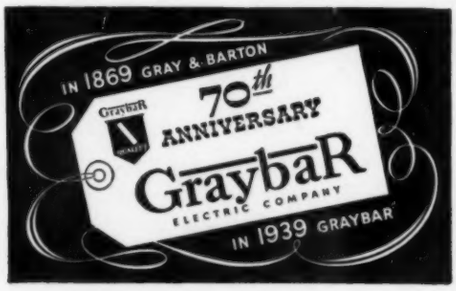
For example, you get a solid Graybar guarantee backing up every sale.

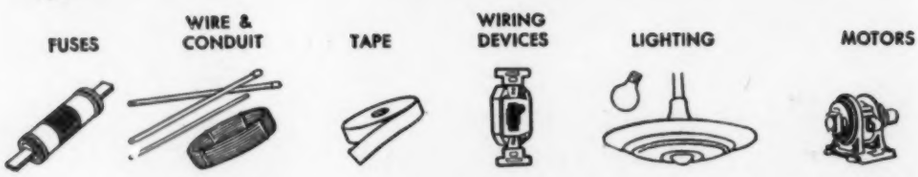
You get prompt "action service". . . either at convenient pick-up counters . . . or by truck delivery . . . to bring you what you want, *when* you want it.

You get the willing assistance of Graybar men experienced for years in serving contractors' needs. This experience—as indicated by the tag below—goes back through 70 years of growth with the electrical industry.

You get the benefit of a nearby Graybar warehouse, carefully and amply stocked with the materials you will need. Furthermore, Graybar is glad to cooperate with contractor customers in building up special stocks for specific needs.

You get . . . in other words . . . *plus value* for every dollar you spend with Graybar. And you deal with a responsible, financially strong, and permanent source of supply. You can depend on products from Graybar. You can depend on Graybar!





OFFICES IN 83 PRINCIPAL CITIES • EXECUTIVE OFFICES: GRAYBAR BUILDING, NEW YORK, N. Y.

Wiring on TREASURE ISLAND

New lighting ideas and practical wiring methods used in wiring the Golden Gate Exposition — Who did the work.

By W. A. Cyr

TREASURE Island is the name of the 400-acre field upon which the Golden Gate International Exposition has been built. It was literally lifted out of San Francisco Bay by electric dredges. Electricity plays the major part in transforming the fair grounds into a dream world at night.

To create this illusion, fluorescent units are used in the major decorative lighting scheme, in colors pink, blue, green and gold. Also fluorescent paints in huge murals are energized by 250-watt "black light" ultra-violet lamps. Also, underwater lighting is handled successfully by temporary methods. It reveals new technique that contractors can use to advantage in spectacular lighting of county fairs, expositions and festivities anywhere.

Radial Distribution

A radial distribution system was selected to simplify switching. The newly created island, which is to be a permanent airport after the fair is over, is served by a 3 conductor 500m cm submarine cable at 12 kv. to the main substation which has a 16,000 kva. capacity. A second substation, of 4,000 kva. capacity, is located in the center of the Gayway or amusement zone.

The 12 kv. is stepped down at each substation to 4 kv. for distribution to the 40 or more transformer vaults. The 4 kv. feeders, 15 from the main sub, 4 from the Gayway sub, are run on 4/0 40% rubber and braid conductors, 1250 kw. per feeder, in shallow trenches in the sand, covered with a redwood plank. Where feeders go under roads they run in a short length of duct.

Twelve of the transformer vaults under the main palaces have two banks of transformers, one for the decorative lighting, the other the general purpose and exhibit lighting. Four of the vaults provide 480-volt, 3-phase power for the fountain pumps. Power for large exhibitors, such as Ford, is provided in a similar manner.

To control all decorative lighting from the main substation, feeders No. 1 to 4 serve this load alone. Street lighting works off one side of a 4 kv. bank, in a series system, 2,300 volts to ground. Four circuits, cascading at 4 locations, and two spare circuits, handle the street ground lighting from the main sub.

Taps from the main feeders are staggered so that no two adjacent transformer vaults are on the same feeder. In case of loss of a feeder an entire section would not be dark. Taps are made at simple wooden splicing boxes covering the feeder wires and brought through G & W fused disconnects to the banks of 4000/208/120 volt transformers in the concrete vaults.

Decorative lighting circuits are run to fused disconnecting panels near the load, and then in open wiring on porcelain knobs on racks or railings, 4-wire,

COLOR TECHNIQUE — *Subtle shadings of color result from fluorescent and mazda combinations concealed behind shrubbery, niches and setbacks, as in this Court of the Moon.*

3-phase, 120/208 volt, in 4000-watt circuits.

General purpose lighting circuits are either run underground, in the manner described, to individual buildings, or attached to the lower trusses of the floor joists by means of special clamps devised for the purpose. Taps are made to such secondary buses through the floor of the exhibit palaces. All wiring above the floor must be in conduit, either of the rigid or electric metalic tubing types. Inspection is under the jurisdiction of the Department of Electricity for the City of San Francisco.

The primary distribution system, and transformer vaults, and the outdoor decorative lighting on the main palaces was installed by the electrical staff of the fair itself. All other wiring on the fairgrounds has been done by electrical contractors. This included the installation of the general lighting inside the exhibit palaces, the wiring of all of the private exhibit buildings, the government buildings, both state and national, the foreign government buildings and all of the work for exhibitors in the main palaces.

Spectacular Lighting

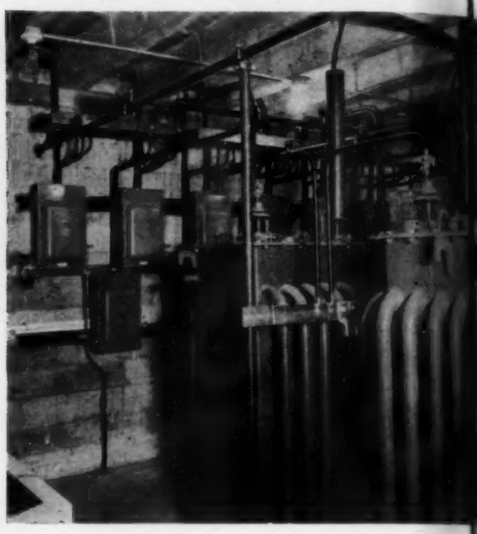
Treasure Island will see the first major use of the new 15-watt fluorescent lamps as a floodlighting medium. Some 2,500 of the new lamps are used to flood the inner court walls, to light up niches and decorative grilles. Some are mixed with the familiar floodlighting from aluminum, mazda-lamped reflectors with color lens. They are enclosed in a special low-cost aluminum trough-like, glass covered unit, mounted on short lengths of wooden board and adjustable as to angle. There are 8,000 of the mazda floodlights of 300 to 1,500 watt sizes, and also searchlights of 1,500-watt size.

COURT OF REFLECTIONS—*Treated canvas tubes and disk reflectors for these Cambodian standards require 2000 watts per fixture. Blue fluorescents in the palace niches complete the effect.*

The effectiveness of these new light sources has been realized especially in lighting the Court of the Moon, 450 ft. long, with walls rising 80 ft. in height. To floodlight these walls in the deep blue and violet desired, by mazda lamps alone, would have required four to six times as much electricity. Fluorescent units will spread their light over the lower walls, and mazda floods reach the higher portions of the wall, with fluorescent units in the upper niches and along the upper set-backs.

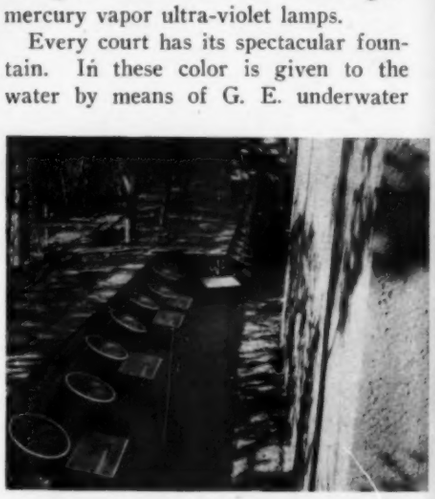
The Court of Reflections, with delicate salmon tinted walls, is flooded with the pink fluorescent units alone. Gold fluorescent lighting will characterize the Court of the Seven Seas. Along the tops of the walls the figureheads of ancient galleys protrude, and 50 ft. lighting standards will be the crows-

SAFE DISTRIBUTION—*About 40 concrete underground vaults house the Exposition's transformers. Each station comprises separate banks for decorative lighting and exhibitors' requirements.*

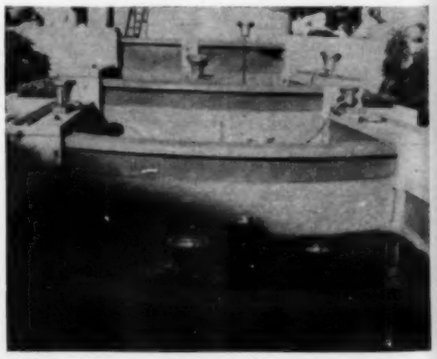


nests of sailing ships. Four murals, 40 ft. high, painted in fluorescent paints, will glow under 250-watt "black light" mercury vapor ultra-violet lamps.

Every court has its spectacular fountain. In these color is given to the water by means of G. E. underwater



TUBES AND PROJECTORS *are banked together to share the floodlighting of large wall surfaces. Fluorescent boxes mounted on loose boards permit easy placement.*

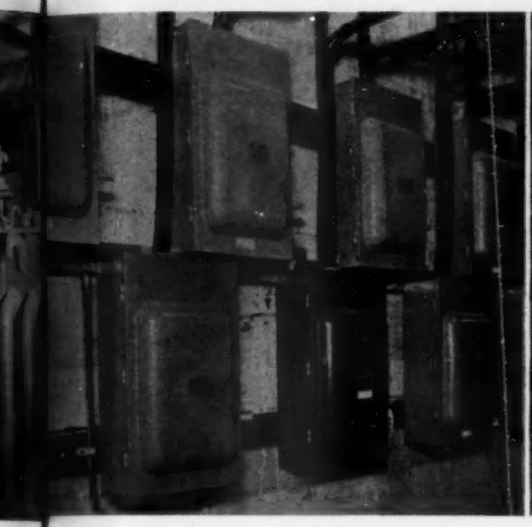


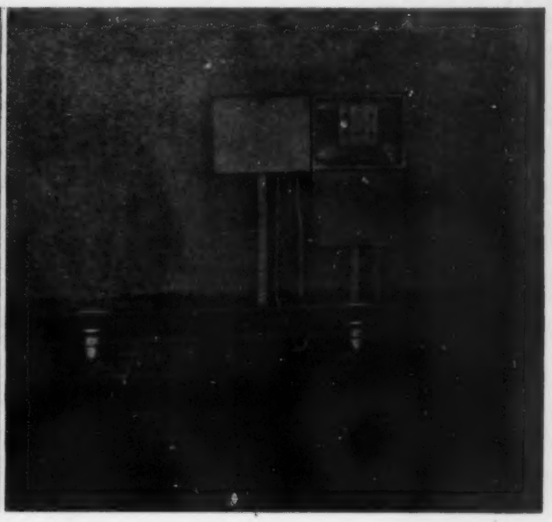
FOUNTAIN FLOODS *are portable, employing small concrete anchoring blocks and rubber cord, to provide quick changeability in underwater projection to meet new ideas.*

LOAD CONTROL—*Radial distribution employed 3-pole switch groups like this for controlling the feeders of each vault's area. The neutral bus also supports one end of each switch enclosure while effectively grounding them all.*

SYSTEM SPLICES—*Redwood splice boxes with plank tops were located in cable trenches behind shrubbery to enclose taps made in the rubber covered system of 4/0 and 1/0 underground feeders. Bare neutral left outside.*

ROOF PANELS *controlled 4,000-watt, 4-wire No. 8 open-wiring circuits serving outdoor effects on buildings. Wiring was inaccessible to the public so was supported on a wooden railing by split knobs.*





units, of 400-watts. These are anchored to small concrete blocks that permit movement for adjustment to the water stream. A length of rubber covered cord serves each unit, waterproofed only where it enters the fixture and the outlet box. Under the trees, 400-watt mercury vapor lamps, in reflectors, are set below the ground surface to throw their light up under the trees.

LONG RANGE—*Banks of searchlights and floodlights cover the tower sides. Here six 1500-watt searchlights and six 1000-watt floods blend amber and clear light.*

BANKED FLUORESCENTS—*A battery of blue tubes in board-base housings flood this Court of the Moon facade. Four-wire circuits feed flexible cords to moveable lights.*

Fixtures to provide general lighting and light on the walks and streets are fashioned to represent Cambodian, Mayan, or Oriental decoration. These have been made in the shops of the exposition from ingenious combinations of steel poles, steel framework, metal disks and cones, and a novel use of glyptol treated white canvas duck. Cylinders of this duck are wrapped about a framework containing strips of incandescent lamps, and then closed by means of a long zipper. In the Court of Pacifica these standards are 86 ft. in height. Lamping is done by climbing pole steps inside the cylinder.

Contracts and Contractors

Interior lighting of the palaces, installed by contractors, provided no mean problem. With roof trusses sweeping in an arc from 20 ft. above the floor to 60 ft. at the center, the installation and relamping of the high bay aluminum reflectors (500 to 1,500 watts) taxed the ingenuity of engineers and contractors. In the Palace of Electricity, the Pacific Gas and Electric Co., designed continuous lighting troughs along the roof chords—1,650 ft. in all—with 100-watt lamps on 1 ft. centers. H. C. Reid Co. installed and will relamp these.

Among the larger contracts were:

Victor Lemoge—Administration Bldg., California Coliseum and Live Stock Pavillion, Palace of Fine Arts, Building of the Pacific.

Alta Electric & Mechanical Co.—U. S. Government, Bank of America.

Charles A. Langlais—Mining mountain, Chrysler, U. S. Steel, Hawaiian Bldg., California Agriculture Bldg., Du Pont, Chinese Village, Bell Telephone and Westinghouse exhibits.

Abbett Electric Co.—General Motors, California Recreation Bldg.

Severin Electric Co.—Fire alarm system throughout the fair, Pan American Airways, Owl Drug Co. Bldg.

T. L. Rosenberg—Armour Co., Libby McNeill & Libby, California Packing Corp., National Biscuit Co.

Pacific Electric Motor Co.—Ford Building.

Kuchel & Sievers—Brazil Building.

Lynch Electric Co.—Floriculture Bldg., Latin American Group, Sacramento Valley Bldg.

Stone Ryals Electric—Southern Pacific, Pacific Gas and Electric Co., Pacific Gas Assn.

Klimm Plumbing and Electric Co.—General Electric house of magic.

Croum Electric—Jahore State, Christian Science Monitor Bldg.

Armstrong Electric Co.—San Francisco Building, Group of California Counties building.

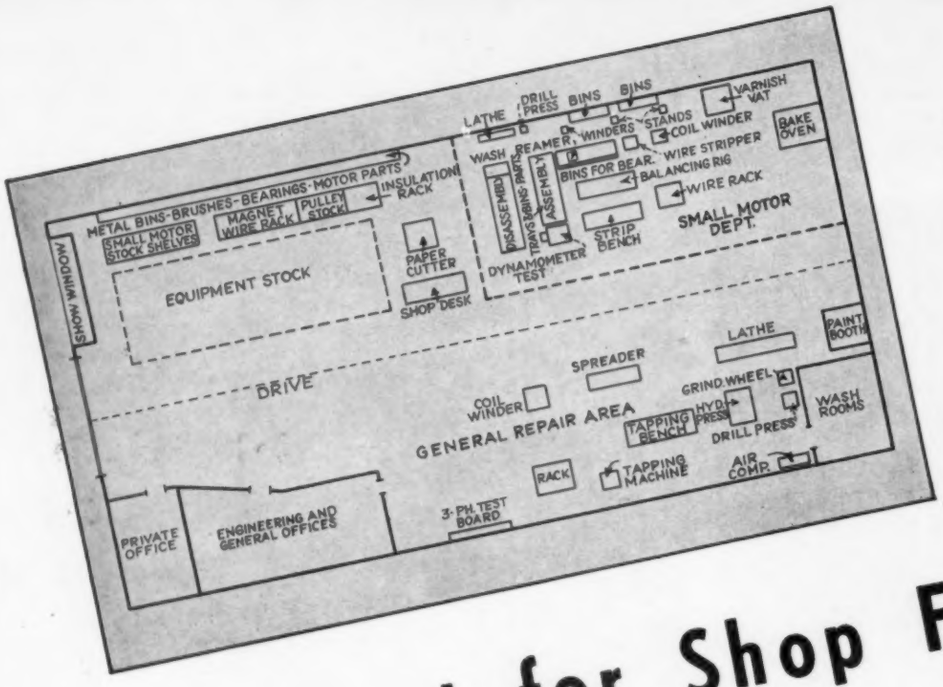
Central Electric Co.—Western States Bldg., Illinois Bldg., Shasta Cascade Bldgs., State Agricultural Bldg., Womens Clubs Reception Bldg.

H. C. Reid Co.—California State Auditorium, Missouri Bldg., National Cash Register Bldg.

Spencer Electric—Argentine Bldg., California State Bldg., University of California.

Kenney Electric Co.—French Pavillion, French Indo-China Bldg.

An exposition like this is a temporary affair, and climatic conditions permit open wiring that could not be tolerated were snow to be a factor during construction or operation. Therefore, the basic decorative lighting system at San Francisco's fair is exceedingly simple and comparatively inexpensive. But the use of first class materials for conductors gives assurance that they will stand up.



SPACE DISTRIBUTION—*This new shop's layout keeps everybody's path clear and so promotes efficient production.*

A Layout for Shop Functions

How the general facilities for industrial motor service were organized for a new southern motor shop

LOOKING ahead to a steady increase in all types of industrial motor service, a new Jacksonville, Fla., shop made a special study of its floor area. They wanted a layout that would provide balanced and ample facilities for handling apparatus sales, heavy repairs and small motor work. It was worked out in a way that has avoided congestion and lessened waste traffic in the flow of work.

The Jacksonville Armature Works serves industries in north Florida and south Georgia, and is called upon to do a wide variety of work. Its volume has grown. So to handle all phases of repair and reconditioning, under modern methods and with maximum efficiency, a $25,000 investment has been made at a new and larger location.

Equipped with the latest type coil winding equipment, a coil spreader, taping machine, baking oven, testing apparatus, machine tools and other necessary tools for shop production. the small motor department was given particular attention. This department was established to take care of the growing bulk of business in the small motor field and to handle it with profitable production methods. The company's aim was to "make out" on small motor work under a one-year guarantee policy, without fear of comeback losses.

The layout, was worked out by Homer Hull, manager of the company, with an arrangement of equipment in a 50 ft. by 100 ft. area. It is all on one floor. It suggests ideas for other concerns that contemplate altering or enlarging their facilities, particularly those wishing to centralize the small motor department. For the Jacksonville shop has provided a separate space for handling small motors apart from other work. Here ten or more men can work at their respective operations without being crowded, and yet they are isolated from the public, near the shop supervisor's desk, and their work does not get mixed in with heavier repairs.

The deciding factor in shop layout often is centered around the manner of routing incoming work. In this shop the center aisle is clear from front entrance to rear wall for trucks to unload or pick up any item along the line. With parts and apparatus stocks located at the front, much of the routine handling of material goes on without blocking or disturbing operations in the two production areas that are divided by the drive-in aisle. The aisle space is used for storing the company trucks at night.

Several other practical conveniences in this layout should be noted—

1. The 3-phase test board is located toward the front, adjoining the office. This permits the larger incoming motors to be tested for customers or for stock under supervision of the engineers, without getting in the way of other work done toward the rear.

2. The shop supervisor's desk is placed near his two repair departments, rather than in the general office. He is thus in constant touch with all routine details and saves considerable time for himself and the men at work.

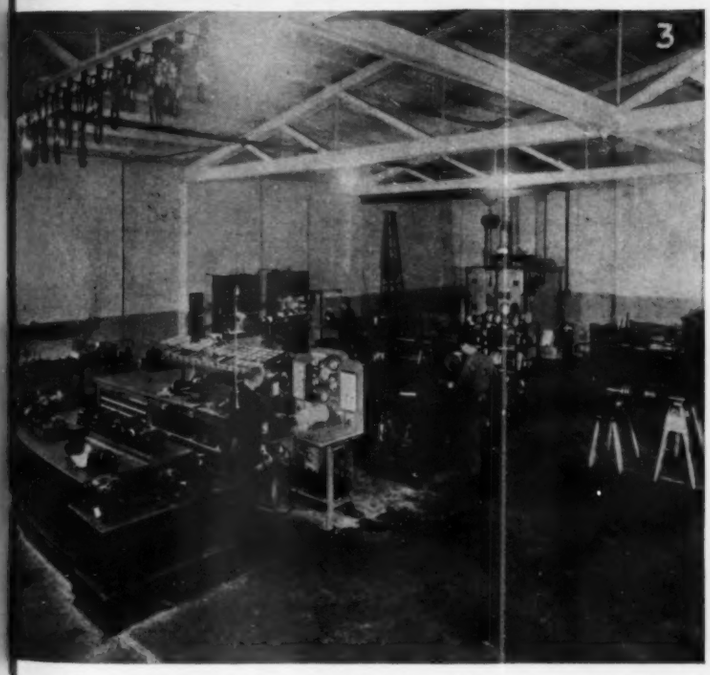
3. Small work comes past the shop desk to be checked in. It moves to the nearest bench, where disassemblies are handled. If a quick test must first be made, this equipment is also nearby. In other words, incoming work never leaves the aisle to become lost among other work, until it is clear for production. After small work becomes routed, the compact layout of benches and equipment cuts down extra handling, before the finished job arrives at the dynamometer stand for final testing.

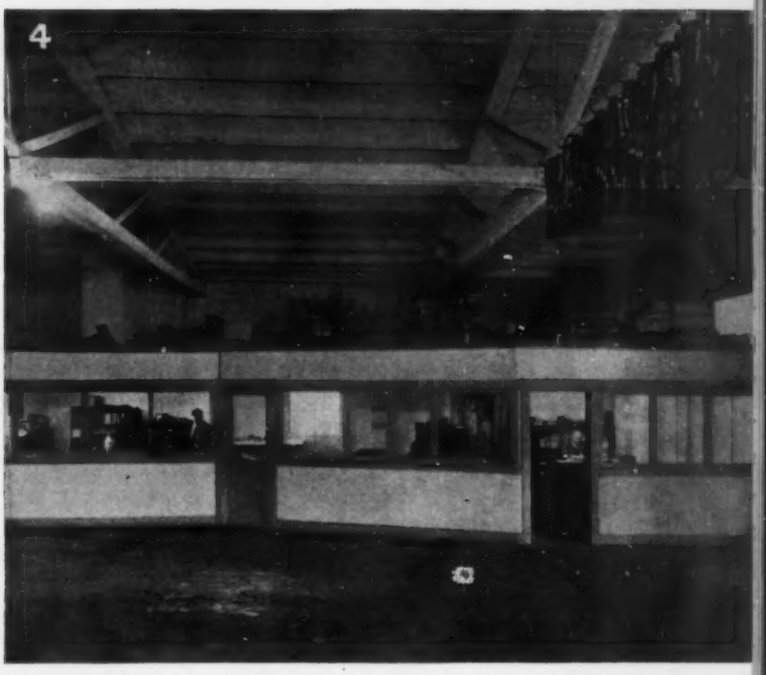
Small work flows through this department in the following manner—

1. When a fractional horsepower motor is received, the work order is made out and complete name plate data taken.

2. The job is then tagged with two tags, each bearing the customer's name and work order number, and sent on to the disassembly bench.

3. Here a preliminary inspection is made and the motor taken apart, with all parts





1. FRONT ENTRANCE—*With front-door shipping, production is centered at rear bays to avoid annoyance. Stocks are up front.*

2. ELBOW ROOM—*Whether apparatus or repair jobs are handled, there is ample space away from busy workers.*

3. SMALL JOBS—*To handle fractionals profitably required a department designed to fit the work.*

4. STAFF QUARTERS—*Shut off from shop noise, the office space remains handy for visitors and work control.*

of one job placed in a sheet metal tray with the tags attached to the tray.

4. The parts are then cleaned with mineral spirits and compressed air, inspected, defective parts thrown out and replacement parts placed in the tray.

5. If an armature or stator is defective, it goes to the stripping bench where the data is recorded. The armature or stator is then stripped and cleaned and sent on to the winding stands with the data card attached.

6. After winding, impregnating, and baking, the part comes back to the tray and the complete disassembled job goes on the assembly bench.

7. When assembly is complete, the motor is placed on the dynamometer test block and checked for starting torque, throw out speed, idle running watts, locked rotor torque, etc., to show that the motor comes up to manufacturer's ratings.

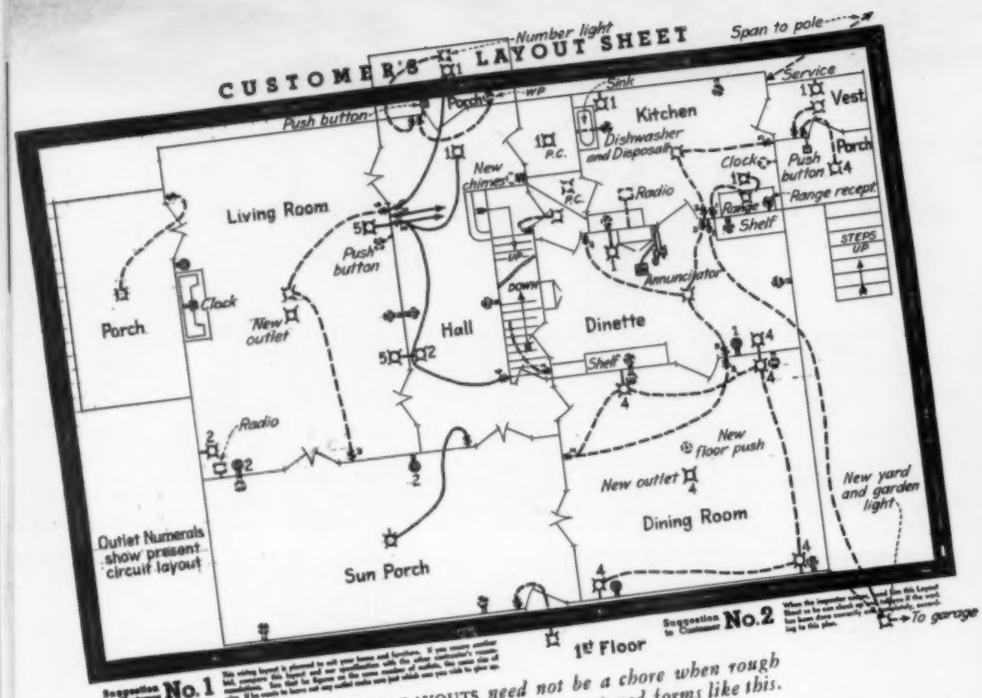
8. On approval of the tester, the motor then goes to the paint booth and on to the shipping department.

9. The assembly man detaches one of the tags from the tray and writes on it the extent of the repairs and places it on a file hook. The other identifying tag remains with the motor as it goes on through the shipping department.

No attempt is made to keep account of the parts which go into a job. All material and parts are charged to the small motor department as they are issued from the stock bins to the trays and bins of the department. Credit is given this department only on the jobs going into it and a monthly inventory is taken for the monthly statement.

FINAL CHECKUP—*Performance details of small motors are dynamometer checked before the machines go out on 12-month guarantees.*

What to



CUSTOMER LAYOUTS *need not be a chore when rough sketches are made to scale on prepared forms like this.*

FACT FINDING *is a must in home modernization. Here a megohmer test is being made of circuit insulation conditions.*

Let These Seven Major Objectives Guide Your Modernization Approach to New Owners of Old Homes

MANY fine old homes are being snapped up at bargain prices these days. It is a used-home buyers' market. And because these homes usually sell far below their original value, many of these buyers do extensive renovating out of the saving affected. That is where alert electrical contractors come into the picture.

Here is a case study of a typical 18-year-old home, located in a New Jersey suburb. It recently changed hands at a bargain price, and the new owner needed help. He wanted electrical safety, he wanted convenience and efficiency. He got it from a local contractor. So let's consider just what the electrical contractor can do for such a new owner—in any town. What should he try to find out? What sort of reports should he make? What is the best approach to the new owner who buys someone's fine old home—and therefore, is in the market for electrical modernization.

Study it and the contractor's opportunity shapes up very clearly. For every old home needs a somewhat similar checkup routine, whether it is a 6-room bungalow or an 18-room mansion. There are hazards to be checked, adequacy to be determined, lack of electrical convenience to be pointed out, tests to make, a layout to prepare, and recommendations to work out. And these seven important points should be kept in mind:

Things to Look For

1. *Existing Hazards.* The usual tangle of haywire, handy-man extensions, and unsightly floor plugs will be found. List them as you go around.

2. *Tight Wires.* Service too small, circuits too few, and excessive voltage losses, come next in importance.

3. *Deteriorated Insulation* must be determined by making insulation resistance tests. The owner doesn't know, but will be interested, if you present these facts in an intelligent manner.

4. *Appalling Lack* of electrical convenience. Very few switches, practically no convenient receptacles, lighting outlets improperly located, many needed lights missing at entrances, driveways, closets. List them all.

Things to Do

5. *Make Rough Layouts* of what facilities are available and should be provided. A sample layout is shown for one floor of the New Jersey home, which shows it simply. Use red crayon to mark in wiring that should be added. It makes an interesting contrast to your lead pencil layout of old outlets.

6. *Identify Circuits.* Set up a schedule like the one shown here. It will help the owner while getting settled, pending the re-vamping job you propose to do.

7. *Prepare Recommendations* covering what your inspection and tests

BRIDGING SPACES *along walls are makeshift cord substitutes for permanent outlets.*

FINE HOMES *change hands and new owners need relief from tight wires and hazards.*

SHOCK HAZARDS *in this bathroom date back to years ago. More work for salesmen.*

Do for OLD HOMES

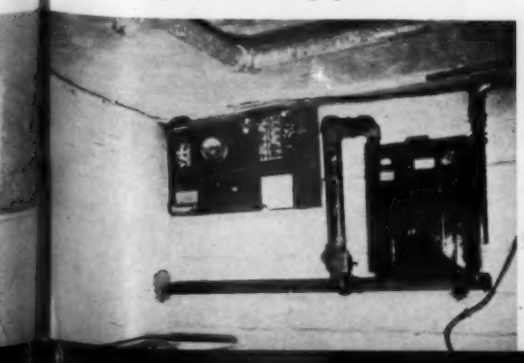
HALL CONTROLS *are neglected and overcome by cord extensions, like this pendant switch from the ceiling above.*

reveal to be necessary. Write them up. It will impress the owner, will prevent mistakes in your own estimate, and will keep your men straightened out while the job is being done.

So here is a selling program for the contractor who wants to go after carefully selected prospects, where the promise justifies the time. To find them, watch real estate transactions and keep in touch with high-class brokers, who specialize in turning the better homes. Then find out something about the new owner, his business and finances, and his attitude toward the better side of living.

Good old homes deserve careful consideration. Their new owners have hobbies, preferences, regard for safety. Ferret out the possibilities. Offer to do something for them that they will like. It will make you money. And there is no better way than to follow out the type of reports made on this New Jersey home as reproduced here.

LOAD RELIEF *dictates drastic revamping of antiquated service equipment.*



A—Report of Circuit and Insulation Tests

Your wiring has been in service for over eighteen years, so we made a test of the insulation. Tests were made by fuse cutout blocks from left to right, top to bottom units. The readings (at right) show: Circuit No. 6 runs underground to garage. The conductor insulation has probably deteriorated due to excessive moisture being trapped for years in its raceways.

Circuit	*Reading*	*Insulation Condition*
No. 1—	10.0 megohms	—good (overfused)
2—	3.0 "	—fair
3—	4.0 "	—fair
4—	3.0 "	—fair (overfused)
5—	1.3 "	—fair (overfused)
*6—	.75 "	—doubtful (overfused)

B—Report of Circuit Identity

We have tested out your old wiring and find that the outlets are now arranged on six branch circuits. These outlets are grouped as follows:

The contractor's detailed report giving a description of all outlets found connected to six existing circuits in this house are not shown here, for lack of space.

C—Report on Present Hazards

An inspection of your wiring revealed a number of dangerous conditions that should be remedied at once. These are:

1—Flexible cord extended to pendant switch at 2nd to 3rd floor stair landing for 3rd floor hall light control.

2—Flexible cord extensions in basement and sun room.

3—Re-fuse all circuits to 15 amp.

4—Remove all Edison screw plug receptacles.

5—Replace floor outlets in living room and dining room with approved types.

6—Install non-metallic "shock-proof" sockets and/or fixtures in bathrooms and basement areas.

7—Overhaul signal system to safe condition, especially floor signal outlet in dining room.

8—Close up junction box in basement to garage room.

D—Report of New Wiring Needed

The attached rough sketches of your four floors show existing wiring outlets in the basement, on the first, second and third floors. Present outlets are shown in lead pencil, and our recommendations are marked on with red crayon. These recommendations are as follows—

1—Present service two No. 10's—Code requires at least three No. 4's if capacity for electrical cooking and water heating is now installed.

2—Replace present service raceway ground with approved ground.

3—Install approved service, metering, distribution and over-current protective devices.

4—Install wiring to electric range and water heater outlets.

5—Provide bell transformer and rehabilitate old bell wiring and annunciator. New entrance and dining room chimes.

6—Install kitchen ventilator, dishwasher, disposal and outlet for future attic ventilating fan.

7—Install additional switches, receptacles and lighting outlets as indicated by red crayon symbols.

8—Replace all existing push button switches with toggle type and plates to harmonize with decorations.

9—Replace old plug receptacles and plates with new devices, to insure good electrical contact.

10—Provide concealed double radio antenna, with wiring to outlets in living room, kitchen, master bedroom, guest room and children's playroom.

11—Rearrange branch circuits to provide not less than eight connected circuits. Leave two spares.

A—Place kitchen, dining room and laundry on one No. 12 appliance circuit.

B—Separate circuit for heating plant.

C—Separate circuit for garage.

D—Separate circuit for attic ventilator.

12—Reconnect other circuits to adequately supply additional outlets.

Alternates

1—This estimate covers the cost to install underground electric and telephone services to nearest street pole.

2—This estimate covers the installation of multi-breaker load centers, with adequate subfeeders, and for re-connecting branch circuits as follows:

Basement—4 circuits; 1st floor—4 circuits, plus range and hot water heater; 2nd floor—4 circuits.

Sixth in a series of reminder lists for men who sell and help plan wiring

Wiring Ideas for Bakeries

THE history of bread making goes back almost as far as mankind. Each year, however, sees a change in some phase of bakery technique, whether in laboratory discoveries, the improvement of mechanical methods or in some other related manner. Bakeries, large or small, are popular users of electrical services.

Hardly a town is so small but that it has at least one baker. The average city of 100,000 population usually numbers around six to ten plants that employ from 20 to 200 workers. There are about 11,000 bread bakeries in the country, of which 4,000 are larger plants. These plants have a diversity of seeing problems, a need for cleanliness. Many use electricity for baking, while motorized machinery abounds for mixing, conveying, air conditioning and other process work.

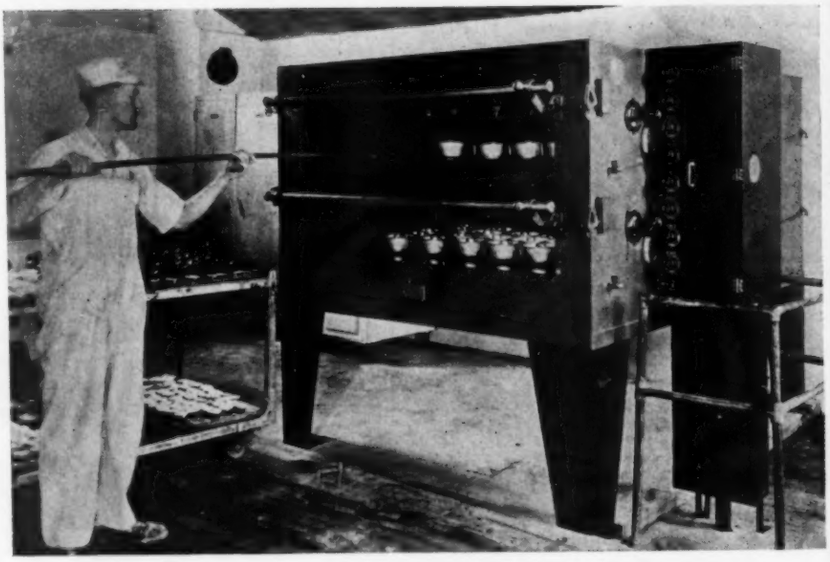
Wiring ideas for the baker, whether in a bread plant or for rolls, pies, cakes, cookies, crackers or even pretzels, need to be based on these basic requirements—

1. Adequate illumination for good local seeing, to expose dirt and to provide maximum safety for plant workers.

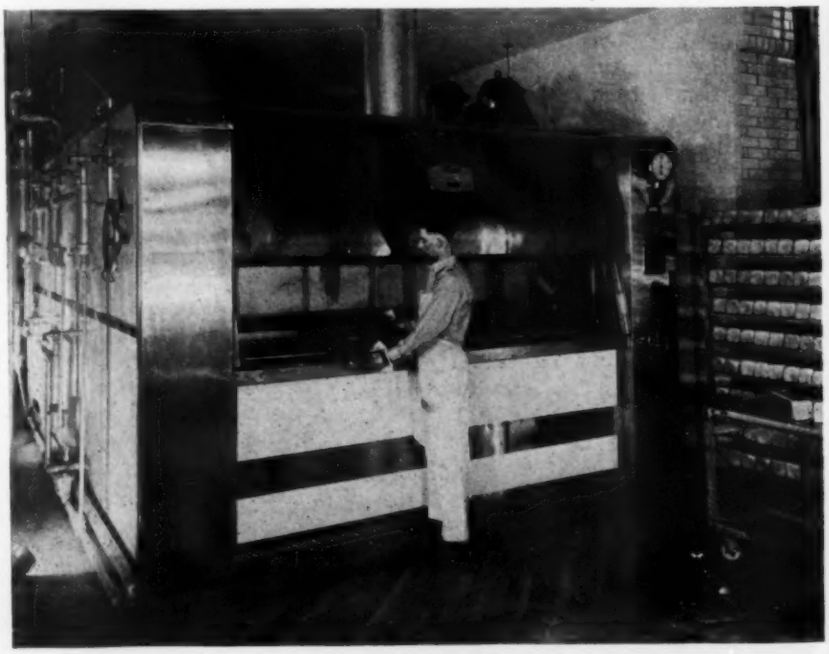
2. Facilities for efficient operation and control of all motorized machinery—to save steps, to avoid stoppage of work, to guard against spoilage of products or damage to equipment, and to eliminate hazard to workers wherever possible.

3. Ample supply of current to operate all electrically heated apparatus at full voltage and top efficiency.

Unfavorable conditions are to be found in most bakeries. These conditions are much involved in wiring design, and the selection of wiring de-



ELECTRICAL HEAT *meets exacting needs for plants of varying size, as for this cake baking department.*



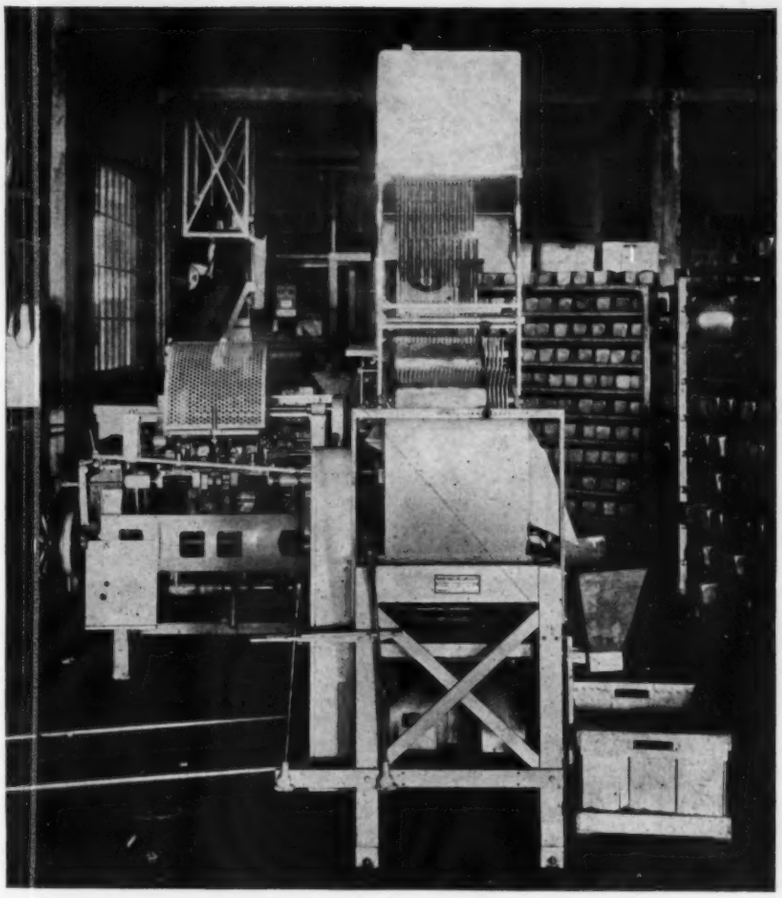
BAKERY TECHNIQUE *employs the best that science and mechanical designers can produce to supply bread for millions.*

vices, lighting units, motors, control and distribution equipment. Here is a job where the electrical contractor's experience enables him to render valuable service in the initial job layout process.

He must give consideration to excessive temperatures at ovens. The air in the proofing room must be kept warm and highly humidified—another electrical trouble source. Some equipment must be hosed down with hot water in the daily cleanup work. Other machines are covered with loose flour or dough, while still others become splashed with fats and liquids that affect insulation life. Likewise the lighting system requires careful selection of units most suited to vapor-laden and dusty rooms. It must provide for local work, where annoying glare and shadows interfere with the safety and efficiency of workers.

So the bakery whether large or small has common problems around which the electrical installation should be designed. Similarly, these problems may not have been considered in the original design of an existing electrical system. Rewiring and re-lighting surveys must take into account the improvement of working conditions in the bakery.

Your town has one or more plants in which to check up on conditions. Make the listings shown on these pages your guide as to what your local bakers should be using.



MACHINE HAZARDS *as at high-speed slicing and wrapping machines, need plenty of protection against costly breakage and employee injury.*

CHECK LIST FOR BAKERY WIRING

MOTOR DRIVEN EQUIPMENT

air conditioning
agitators
baking wheel
battery charging sets for trucks
biscuit cutters
bread slicers
cake mixers
cleaning and greasing machines
compressors
conveyors
cream whippers
dehumidifying apparatus
delivery trucks
dividers
door motors
dough kneaders
dough mixers
egg beaters
elevators
fans, exhaust
flour blenders
flour sifters
food cutters
food paring machines
heating plant
hoists
humidifiers
ice cream freezers
mixing machines
molding machines
office machines
pie-making machines
proofers
pruners
pumps
refrigerating machines
rounders
sack lifters
sieves
unit heaters
ventilating fans
water coolers
whip and hoist
wrapping and sealing machines

EQUIPMENT HEATING

disc stoves
frying kettles
immersion heaters
ovens, all kinds
pan greasers
pastry stoves
radiators, electric
ranges
waffle irons
water heaters
wrapping and sealing heaters

SPECIAL DEVICES

magnetic separators
sterilizing lamps
static arresters

BAKERY LIGHTING

exit lights
flood lights
inspection lights
night lights
signs
vapor-proof fixtures

BAKERY SIGNALS

annunciator systems
bin and hopper signals
burglar alarms
bells or howlers
for start and stop signals
code calling systems
conveyor signals
fire alarm systems
push button-buzzer call system
tank level alarms
temperature alarms
telephone system
time clocks
timing signals
time stamps
vault pilots
watchman systems

A general lighting intensity of 20 foot candles is recommended. Supplementary lighting is desirable at locations which involve critical seeing. Dangerous work, such as at slicers, wrappers, mixers, should have supplementary lighting. Close work such as in decorating cakes, weighing or blending special batches, and laboratory tests, require special treatment.

Explaining POWER FACTOR

By Ward Harrison
Director Nela Park Eng. Dept.
General Electric Company
Cleveland, Ohio

A FLOURESCENT lamp, with its auxiliary as used on an a.c. circuit, has a power factor of about 60%. Only about 60/100 of the current going through the wiring system does useful work. In other words, there is something about a fluorescent lamp with its auxiliary that requires more current in the circuit than it actually consumes, and fully 40/100 of the wiring capacity is needed for this extra current.

Perhaps an understanding of power factor and its effects can be simplified by the following analogy:

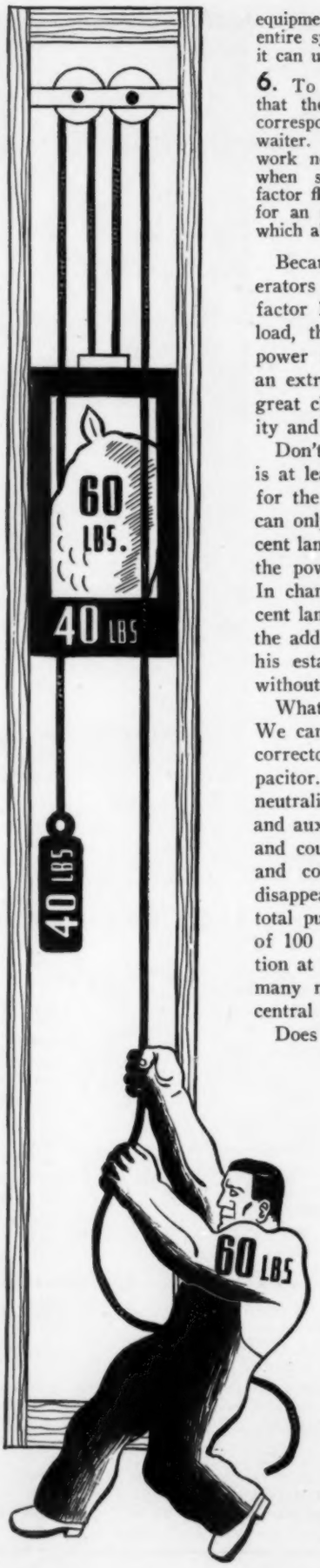
1. Suppose you have a dumb waiter and it weighs 40 pounds. You can counterweight it with a 40-pound weight so that it can be moved up and down practically without effort. The strain on the rope is 40 pounds.

2. If you load the waiter with 60 pounds of potatoes and wish to raise it to an upper floor, you naturally will take hold of the same end of the rope that the counterweight is hung from and give a 60-pound pull downward. This will cause the dumb waiter to move up. In other words, you have exerted a useful pull of 60 pounds.

3. Now the total strain on the rope is not 60 pounds, but 100 pounds, because your pull was added to that of the counterweight which was pulling down 40 pounds.

4. The rope had to be larger and stronger than would have been necessary if you had no dumb waiter, but just a rope run over a pulley with which to raise the 60 pounds of potatoes. The fraction 60/100 gives you the comparison between the useful pull on the rope and the total strain on it. Now we might stretch our imaginations a bit and call that 60/100 or 60% the *power factor* of the dumb waiter installation, particularly so far as the rope is concerned.

5. Likewise in a wiring system for fluorescent lighting equipment, there is about 40% of the current which performs no useful work. This current, however, must be added to the useful current in order to determine the economical size of all the wires in the branch circuits, main feeders, transformers, transmission cables clear back to include the wires in the generating equipment at the central station. Hence this entire system has a 60% power factor because it can use only 60% of its designed capacity.



6. To conclude the analogy, we should say that the turbine which drives the generator corresponds to the man who operates the dumb waiter. It does not have to do any more work nor will its boilers use any more fuel when supplying current for a 60% power factor fluorescent lighting system than it would for an equal wattage of incandescent lighting, which always has a 100% or unity power factor.

Because the wires, transformers and generators have to be larger for a 60% power factor load than for a 100% power factor load, the central stations do not like low power factor. They are entitled to make an extra charge on that account, but not a great charge, because of the greater capacity and investment required.

Don't forget also that poor power factor is at least as bad for the consumer as it is for the power company. It means that he can only put about 60/100 as many fluorescent lamps on his existing circuits as though the power factor were corrected to 100%. In changing over from filament to fluorescent lamps, therefore, it prevents his getting the additional footcandles of illumination in his establishment that he otherwise would without rewiring.

What can we do to improve power factor? We can put what is called a power factor corrector in the circuit—a condenser or capacitor. If this is of the right size, it neutralizes the effect of the fluorescent lamps and auxiliary, just as if we were magicians and could somehow make the dumb waiter and counterweight in the above analogy disappear into thin air and thus reduce the total pull on the rope to 60 pounds instead of 100 pounds. With power factor correction at the lamp, the consumer can then put many more lamps on his circuit, and the central station is also happy.

Does everything but a fluorescent lamp and its auxiliary have a good power factor? No. About the only things on a central station's lines that have good power factor are heating devices. This general classification would include filament lamps, hot pads, irons, toasters, percolators and electrical cooking devices.

In general, the alternating current power equipments used for industrial operations have power factors of the same order as that for fluorescent lamps. It is common practice for industrial companies to install power factor correcting equipment rather than accept a penalty charge from the power company. Penalty charges are not usually made if the average power factor is 85 to 90% or higher.

Modern Devices for

ADEQUATE WIRING

ADEQUATE WIRING SERVES AND SAVES

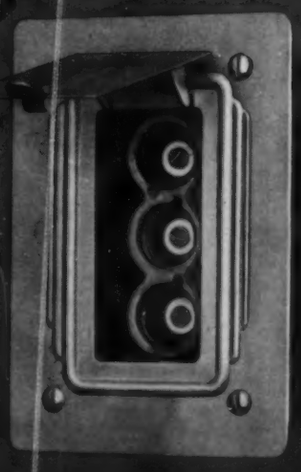
C-H Pendant Main Switch
Above: Hailed as the greatest single contribution to service control, offering a host of advantages. Bulletin 4334H17.

Cutler-Hammer Multi-Breaker
The wiring device that is changing the habits of a nation.
Above: The most modern example of this type of equipment. Foolproof, safe, economical, convenient from every standpoint.

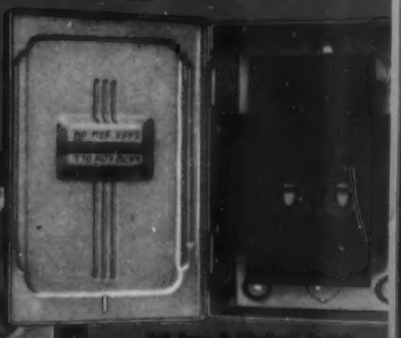
C-H Pull-out Main and Range Switch
Above: Built to make installation easy, to save service calls, to permit testing without interruption to service. Bulletin 4334H15.

C-H Pull-out Rain-tight Main Switch
Above: A modern pull-out type main switch in a cadmium-plated rain-tight enclosure for installation in outside locations. Bulletin 4345H1.

C-H Trailer Camp Panel
Above: Designed specifically for trailer camp operators. 30-amp. 3-branch circuit device with 3-plug fuse receptacles in rain-tight case. ¾" conduit hub in top; slot in bottom for extension cords. C-H Bulletin 4389H1.



"Exclusive." The New C-H Tri-branch Fuser
At Right: A new economical means to more adequate wiring. 3 fuse-protected circuits for each unit. Small, attractive, easy installation. A luxurious building for the small home market. Bulletin 4388H1.



C-H Type B "Feller" Switch
Above: Entirely new principle of trip operation. Small size with big work space. 10 outstanding features. Dress front. Aluminum finish. Low cost. C-H Bulletin 4302H1.

C-H Cover-operated Main Switch
At Left: Removable interior, dress front, easy installation. Meets the wanted service control features of the Bulletin 4331H7.

The drive for adequate wiring depends very definitely for success on the use of new and better devices. Meeting high standards of quality at a low price can be achieved only with devices *engineered* for the market's needs. Easy installation; simple foolproof designs; rapid, low cost wiring; are of utmost importance. Cutler-Hammer leadership in making such modern Service Control available is fully appreciated by the men who are making Adequate Wiring the source of increased business volume and profits. It pays to keep ahead of the field with Cutler-Hammer

CUTLER-HAMMER, Inc., *Pioneer Electrical Manufacturers,* 1306 St. Paul Ave., Milwaukee, Wis.

CUTLER-HAMMER
SERVICE CONTROL
C-H

More Good Stuff for Wiring.....!

NEW promotional material for the 1939 Adequate Wiring Program is just ready. It is splendid!—Good practical, helpful stuff that any contractor can use in any town.

The best part of it is that all this new matter supplements the old material still available for use. It is not just different. It is additional. For example, it embraces—

1. *The 1939 Plan Book* presenting the AW purpose and program, progress so far, and what to do next, the new promotion materials and how to use them.
2. *A Check Chart* with which consumers can check up on their present wiring conveniences—or inconvenience.
3. *Three Sales Helps for Contractors*—
   —A proposal form.
   —A layout sheet and specification form
   —A cutout sheet, combining furniture cutouts to lay on the plans and cutouts of receptacle plates to pin on the wall.
   These practical aids in selling house wiring jobs are all adapted from the forms developed by "Electrical Contracting."
4. *Six Cartoons,* each with a story that brings the adequate wiring idea home to the householder.
5. *Eight new Newspaper Ads.*
6. *Five Publicity Stories* with clever cartoons.
7. *New System Material* for use by local A/W local bureaus.
8. *Copy for a Billboard Poster*—which makes a good window poster too.
9. *House Planning Digest* of plans and layouts for six houses, contributed by popular home magazines in cooperating with the campaign.

This new promotion material greatly strengthens the National Adequate Wiring Campaign for you.

No one can look this good stuff over without enthusiasm. The new cartoon treatment of the wiring story is an inspiration. It puts over the points with an interest impossible in ordinary arguments. Altogether, residence wiring gets a real boost.

But the most important thing is to *use* this good stuff—and go forward with the A/W program. Last year saw it well started. The Plan Book lists definite diversified progress that is worth your study, because it is all experience that can be capitalized in your own town and, with the increased building, this year will bring new speed and power to the plan.

This is every contractor's opportunity. The first step, of course, is to help get an A/W Bureau going in your town. For all the new homes to be built and half the old homes in your city can be sold more adequate installations, if this idea is made interesting to your local people. And this A/W material makes it interesting.

PERFORMITE

ENDURES

Monumental buildings are built to endure. Only the best of materials are used. Performite insulation for all wires and cables is long-lived, and is ideal for all monumental types of buildings.

By all known accelerated aging tests, Performite rubber insulation is far ahead of any other commercial insulation. It is non-corrosive, free-stripping, long-lasting. Performite shows surprisingly little deterioration in the oxygen bomb, air bomb and air oven accelerated age tests.

UNIFORMITY
SAFETY — PERFORMITE WIRES & CABLES — LONG LIFE
DEPENDABILITY

One of its outstanding characteristics is its resistance to deterioration by heat. It is recommended for operation at conductor temperatures up to 75 degrees Centigrade, thus providing a tangible advantage over most other types of rubber insulation in economy of copper size. Its stubborn resistance to heat makes it better suited than ordinary rubber insulations for hot locations.

Thus, Performite is the perfect wire for buildings built to last—assuring long life with resistance to heat.

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.
WORKS: WILKES-BARRE, PENNSYLVANIA

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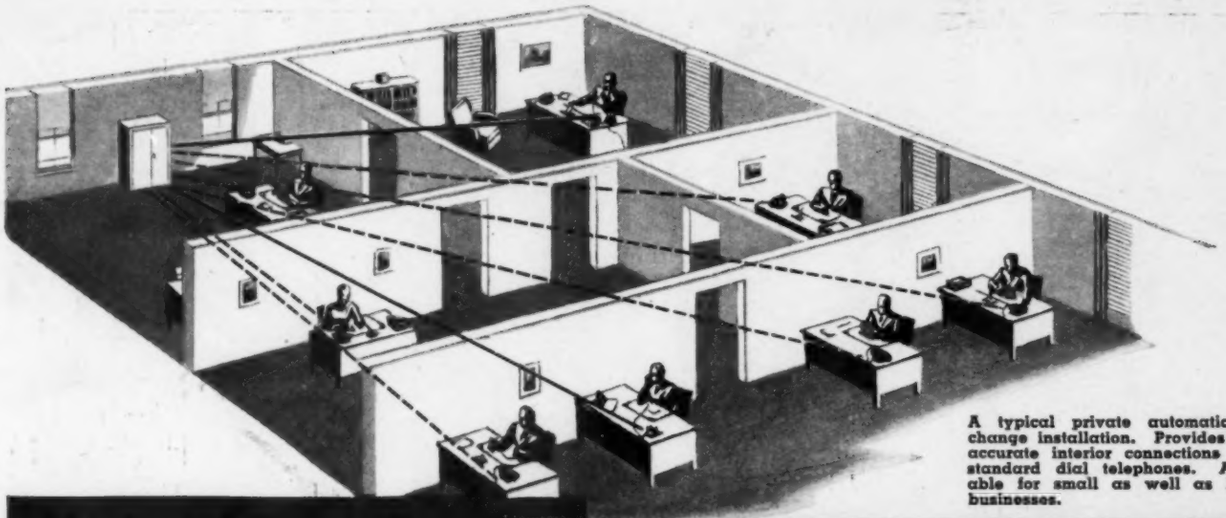

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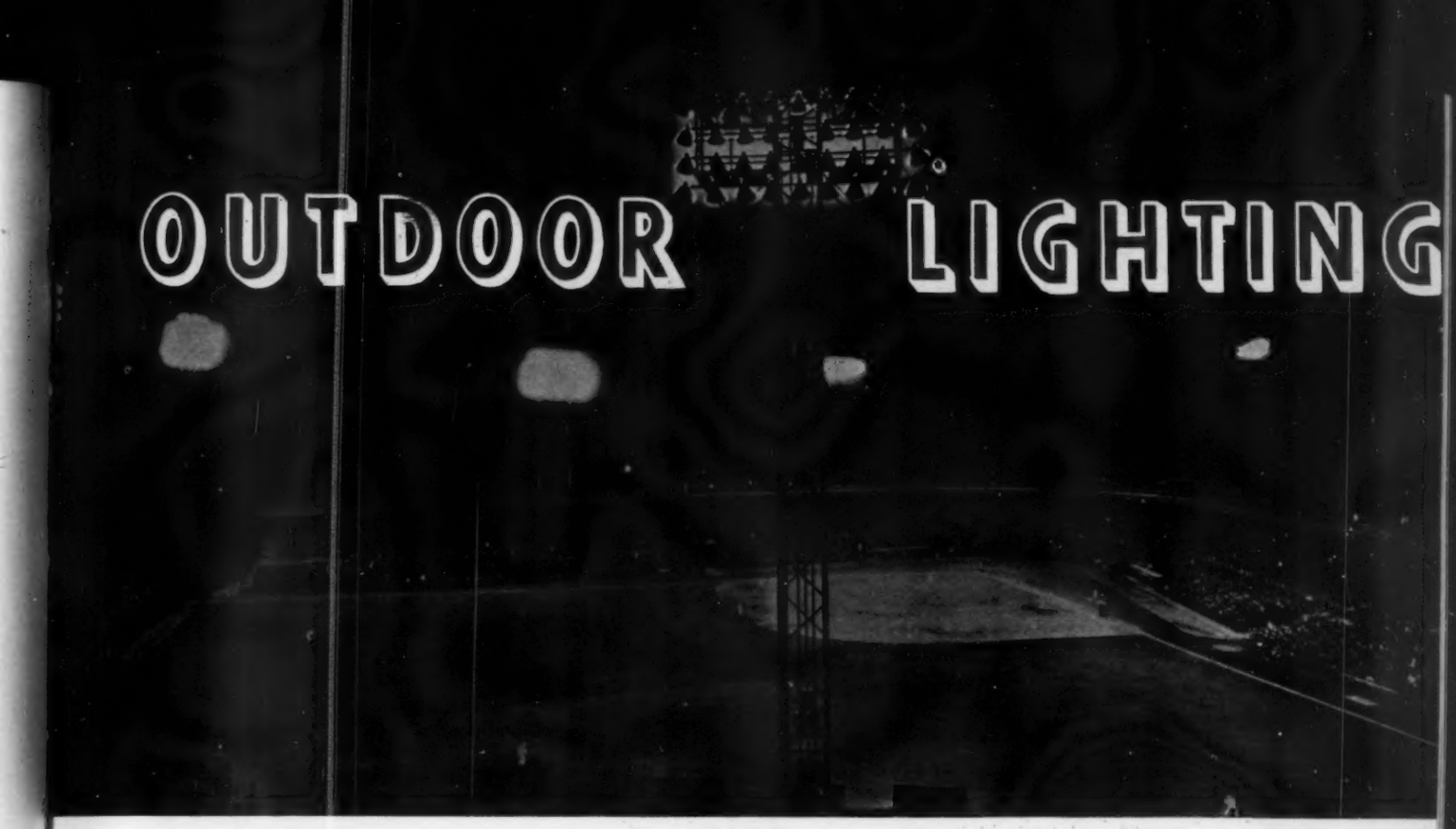
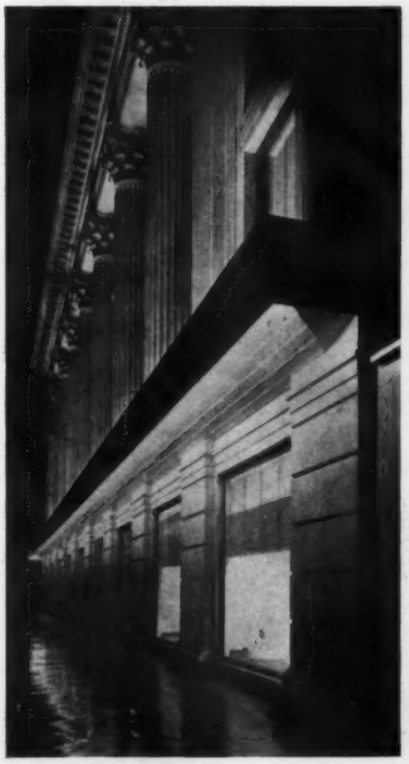


. . business for all kinds of Contractors

MANY electrical contractors look upon outdoor lighting as a specialty and they "don't bother with it." They overlook the fact that every man's real specialty is his own customers. And every contractor's customers are in the market for outdoor lighting—if a little selling is done.

The point is that here is just another kind of lighting that is used by factories, commercial buildings, stores and every other kind of business, as well as for homes, play areas and for a long list of other applications. This makes a wide market for outdoor lighting in every community, available to every contractor, because it concerns the very people now on his books. Altogether there are more than 70 places where this type of equipment may be sold.

Looking at it broadly, outdoor lighting falls into four general classes—(1) industrial; (2) commercial; (3) recreational and sports; (4) residential, civic and public. These four classes embrace units for floodlighting, yard lighting, sports lighting and many other kinds of outdoor equipment. Some part of it fits into the experience and concerns the present work of every contractor. It offers interesting and profitable opportunity not only in the sale of the equipment but because outdoor lighting builds more wiring business to supplement the normal flow of general inside construction volume.



The scope and variety of this outdoor lighting market is broken down and analyzed in this Editorial Feature Section—Pages 21 to 41

Outdoor lighting offers three kinds of business to the contractor—permanent systems, temporary installations and maintenance of existing systems. Since the benefits derived from temporary lighting often lead to permanent installations, he benefits in two ways if he will give attention to this initial step. A good system of temporary lighting for the opening celebration of a new theatre or store will often lead to a high grade permanent installation. Nearby competitors will also be affected and become live prospects. Once a permanent installation is made, the periodic maintenance of its equipment and wiring offers further possibilities.

Full recognition of the specific opportunities that lie in the outdoor lighting field can only be gained, however, from a breakdown of the many places where light will serve a useful purpose outdoors. Some of these are given in the following pages. Each class will broaden in scope and application as the contractor himself checks the conditions that exist in his community. The first step, however, is to review—how to develop prospects, what to offer them, how to make outdoor lighting profitable.

OUTDOOR LIGHTING MARKETS

LEISURE TIME *for most people comes in the evening and lighting tennis courts increases use and revenue.*

THERE are various ways to provide outdoor illumination. But the first step in approaching it is to study the various uses of it that you can suggest to your class of prospects. In a word, explore the needs first. Then associate them with your own customers. Here are some 72 places to sell outdoor lighting and suggestions as to the best approach.

For Industrial Customers

1 *Factory Yards*—Night lighting is necessary for many reasons. Stress safety, protection and ease of locating materials. Floodlight from roofs of adjacent buildings.

2 *Employee Parking*—For convenience and security of employees on night shifts.

3 *Factory Play Areas*—Employee outdoor recreation can be made a further asset to the factory by encouraging night play. Shift operations have made this more important than ever.

Advertising—Display spaces on towers and stacks are available for night time advertising.

5 *Material Storage*—Outdoor areas used to store materials and machinery need lighting to simplify night handling, to prevent accidents, breakage and theft.

6 *Factory Craneways and Bridges*—Hazards of handling materials during night shifts impose responsibility on management to provide safe levels of visibility.

7 *Railroad Spurs and Docks*—Check conditions to point out places where handling damage and accidents to night workers can be lessened.

8 *Mines and Quarries*—Increase in night production, safer use of machinery and improved maintenance depend on how liberally outdoor lighting is provided.

9 *Stone Crushing and Gravel Plants*—In working areas danger lurks unless good visibility protects night workers and repair crews.

10 *Dredging*—River dredging uses expensive construction equipment. Night operation reduces overhead expense. Use floodlighting projectors on cab.

11 *Construction*—Much construction work is done after dark. Show the general contractor how large projectors with 1000-watt lamps will reduce accidents and improve efficiency.

12 *Outdoor Sub-Stations*—Stress safety also advertising value obtained. Suggest spot lighting landscape features around the substation to make it a beauty spot.

13 *Prison Walls*—Jail breaks are discouraged by well lighted walls.

For Commercial Customers

14 *Store Fronts*—Store architecture often offers possibilities for floodlighting from units placed on the marquise, or ledges. Suggest special effects with temporary units for anniversaries.

15 *Theaters*—Stores are crowding theater fronts for night time attention. Extra lighting effects keep a theater in the running.

16 *Banks*—Bank buildings offer good architecture for dignified floodlighting from niche units or street standards.

17 *Taverns and Hotel Grounds*—Look for arbors, bridges over brooks, distinguishing landmarks, to give the establishment additional charm or distinction. Walks to parking areas, steps and parking spaces require good floodlighting to minimize owner liability and to provide customer convenience.

18 *Funeral Homes*—The appeal is for dignity. Individual treatment of entrances, driveways and planting offers a variety of outdoor lighting applications.

19 *Gasoline Filling Stations*—Check up on adequacy of lighting, particularly over the drive-in areas. Fast-moving traffic is attracted by brightly lighted approaches.

20 *Second-hand Car Lots*—Lots should be well lighted to facilitate night demonstrations and to show feature items. Either floodlights or industrial type reflectors are suitable.

21 *Parking Lots*—Even the smallest parking lots will draw more revenue if lighted. Women will not park in the dark lots. A floodlighting projector at each corner will do for a 100 ft. lot.

FARM SECURITY *also calls for floods. Many customers are waiting outside every town and city.*

22 *Store Parking Areas*—Customer parking space is at a premium in every town. Any merchant who has space can build good will by lighting the driveway and car spaces.

23 *Wall Signs*—Check up at night wall spaces where increased floodlighting or larger sign reflectors will bring results.

24 *Loading Platforms and Truck Passages*—Merchants need protective lighting to speed the handling of vehicles, to avoid damages to equipment, and to curb thefts during the rush delivery hours.

25 *Coal and Building Material Dealers*—Time and accidents saved in night handling, and protection against theft, can be effected with correct floodlighting units.

26 *Road Stands — Fruit, Vegetable, Flower, Shrubbery, Pottery, Antiques*—Light displays parking areas. If road stands are to attract attention, they must be seen for some distance. Stands need lighted signs, floodlighting projectors, angle reflectors or projector lamps. Interior should also be well lighted.

27 *Roadstands—Refreshment*—These are usually lighted, but with insufficient intensity. They need lighted signs and light for surrounding area to permit curb or lot service.

28 *Floodlighting Home Developments*—Floodlighting aids the sale of houses and draws prospective customers. Make demonstration to real estate agents.

29 *Fair Concessions*—Light must draw the crowd. The well-lighted concession will act like a display window.

30 *Traffic Spots*—Congested intersections are dangerous for officers, pedestrians and car traffic. The officer should be spotted by a floodlighting projector located on a pole or adjoining building.

For Recreation and Sports

31 *Baseball*—More than 25,000 high school and industrial league diamonds are prospects for lighting. For average layouts 100-150 kilowatts will usually be satisfactory. They range in total cost up to $8,000 per job.

32 *Football*—Surveys show a steady increase in attendance where night games are possible. Detailed layouts are available covering a wide range of lighting intensity.

33 *Soft Ball*—Thousands of fields are in use today and many are not lighted. Check the larger industries too for prospects. Ten to 15 large open type reflectors or floodlights, mounted on six or eight 40 to 50-foot poles will give ample illumination, depending on the size of field.

34 *Swimming Pools*—Resorts, municipal areas and large estates in every community are likely prospects. Use dry or wet niche method. Overhead lighting is also satisfactory. Underwater use 10 to 20 kilowatts. Overhead use 8 to 10 kilowatts.

CHECK LIST FOR OUTDOOR LIGHTING

Types of lighting equipment that apply to common types of outdoor jobs.

	Concentrated-beam Floods	Weather-proof Floodlights	Water-tight Floodlights	Explosion-proof Floodlights	Mercury Vapor Floodlights	Angle Reflectors	Stand Lights	Utility Floodlights	Suspended Reflectors	Ornamental Standards	Bracket Lanterns	Spotlight Projectors	Step Lights	Warning Lights	Floodlight Poles	Goose-neck Arms	Color Screens	Sodium Vapor Lights
Baseball fields		X													X			
Bathing beaches		X													X			
Billboards						X		X				X				X		
Construction jobs		X			X	X								X	X	X		X
Football gridirons		X													X			
Fountains			X														X	
Fences		X			X	X	X							X	X	X		X
Gardens											X	X	X					
Gas stations		X			X	X					X				X	X		
Gasoline bulk plants		X		X											X			
Houses											X		X					
Loading platforms		X			X	X							X			X		
Mortuaries								X		X	X		X				X	
Office buildings		X								X	X		X				X	
Parking lots		X			X		X		X						X			
Prisons	X	X									X	X						
Public buildings		X								X	X		X				X	
Race tracks		X													X			
Radio towers	X													X				
Railroad yards		X												X	X			
Safety zones						X	X							X		X		X
Signs						X						X				X		
Skating rinks		X					X					X			X			
Swimming pool		X	X				X				X	X			X			
Tennis courts		X							X						X			
Traffic points		X			X									X	X			X
Trap shooting		X													X			
Used car lots		X					X	X	X			X			X			
Water towers	X													X				

35 *Tennis—Recreational*—Five 1000-watt or 1500-watt reflectors, equally spaced on messenger cable, mounted 30 feet high will give sufficient light for this type of tennis and make the sport enjoyable at night.

36 *Tennis — Championship* — Many such courts are below par for fast night play. Need high-intensity illumination —properly directed—about 15-kw. per court using 10 reflectors, five on each side.

37 *Bowling-on-the-Green* — Popular In certain sections but seldom properly equipped for night play. Sizes vary from two to six court greens. Light from sides with angle reflectors equipped with 500-watt lamps.

38 *Horseshoe Pitching*—For a small group of pits, use angle reflectors at each side of the group. For the larger group, one reflector at each corner of the enclosure will be satisfactory—equipped with 500-1000 watt lamps.

QUICK APPEAL *sells a lot of gas to speeding autoists, who stop only when the reminder is strong and appealing.*

39 *Archery*—Watch for daytime play and sell the night play idea. One 250-watt narrow angle projector, located behind each archer and directed toward the target, will suffice.

40 *Handball*—Provides a fine outdoor workout for the business man. Five angle reflectors for the front wall and four RLM's for the back, with 200 watt lamps in each unit, give good results.

41 *Race Tracks*—Many small county fair tracks need lighting modernization to attract night attendance. Elliptical angle reflectors, 50 feet apart, 1000 watt, around outside of track and mounted 30 feet high will do a creditable job.

For the racing association tracks, 1500-watt lamps in RLM dome reflectors, located 30 feet high on 16 ft. mast arms and spaced 50 ft. apart along the inside of the track are necessary. For the home stretch, use same units on both sides of track.

42 *Trap Shooting*—Look up the gun club in your territory. Eight 1000-watt medium angle floodlight projectors, behind handicap stands, permit high scores.

43 *Skeet Ranges*—A relatively new sport with excellent opportunity for lighting. Two banks of five 1000-watt medium angle floodlighting projectors required.

44 *Large Bathing Beaches*—Night bathing is popular. Stress the safety feature of proper illumination. Medium and narrow angle projectors, and 1000-watt lamps, located in banks not more than 400 ft. apart, giving ¼ to 1 footcandle intensity, should be recommended.

45 *Small Bathing Beaches*—Small community beaches need low intensity lighting of the order of 1/10 footcandle. Floodlighting or large open type projectors are satisfactory.

46 *Playgrounds*—To keep children off the streets, school, community and municipal playgrounds are active prospects. Use floodlighting projectors or large open type reflectors, located on adjacent buildings or poles. Provide 2 to 5 footcandles.

47 *County Fairs*—A yearly opportunity to see your local fair committee and work out ideas to help them capitalize on lighting effects.

48 *Pony Tracks*—Generally not lighted, so additional revenue is lost.

49 *Outdoor Dancing—Piers*—Check the wiring and lighting equipment and see that it is adequate and in good shape for the coming season. Note corroded reflectors and dirty lamps.

50 *Amusement Parks*—Competition impels modernization. Check wiring, conduit, corroded reflectors, dirty or burned-out lamps. Note whether entrance is well lighted.

51 *Golf Driving Ranges*—Some ranges are well located but need better equipment to increase night patronage. Others, handicapped as to layout, must overcome it by lighting.

52 *Miniature Golf*—Pitch-and-putt courses are coming back. Attractive lighting will stop passersby.

53 *Skating and Hockey*—Choice spots for this winter sport lack light to permit night-time games. If a play area can be flooded for winter sports the lighting system does year round duty.

54 *Tobogganning*—Community interest is growing in this sport. Good lighting jobs add to enjoyment and safety.

For Residential and Civic Customers

55 *Croquet and Roque*—Family sports for youngsters and oldsters. Light the lawn space with one 500-watt lamp, in an angle reflector located in the eaves of the house or on a pole.

For public courts use four 500-watt lamps in RLM Dome reflectors, symetrically spaced on messenger cable 25 ft. high, or four 500-watt lamps in angle reflectors on poles—two on each side.

56 *Shuffle-board*—This sport may be played on level concrete driveways, leading to the garage. Two handy floodlights on an adjacent building is reasonably satisfactory treatment.

57 *Gardens*—Every family is proud of the garden. Why should its beauty be hidden at night? Your sales approach is aesthetic and protective.

58 *Pedestal Bird Baths*—Place a circle of 10-watt lamps, concealed behind a shield, under the basin of the bird bath, to light the flower bed around the foot of the basin.

59 *Shrubbery*—Pick out an attractive piece of shrubbery and spot it with light. Make a few simple demonstrations to show the customer the beautiful effects that may be secured.

60 *Arbors*—These, too, are often beauty spots that may be lighted for every enjoyment. In any garden they should receive special attention.

61 *Small Fountains*—Simply and economically lighted by the use of concealed clear or colored bare lamps. All joints must be waterproofed with non-hardening aquarium cement.

62 *Lily and Fish Ponds*—Should be treated simply by placing bare lamps of different colors under lily boxes. Make simple demonstration with bare lamp on end of a stick. Lamps must be under water before lighted, otherwise they will break. Pools are frequently lighted from small projectors located in adjacent trees.

63 *Protective Lighting*—Fear of burglary or kidnapping makes any parent interested in this type of lighting. Locate units at or near house. Floodlight projectors work out well.

64 *Approaches and Entrances*—Must be adequately lighted to avoid accidents and minimize congestion. Recommend large open type reflectors or floodlighting projectors. Avoid glare.

65 *Boat Docks*—Provide adequate floodlighting along the path and on dock.

66 *Lawn Fetes and Bazaar*—Learn from churches or community groups, the dates of coming festivities and capitalize on this opportunity.

67 *Scenic Falls*—If there are any scenic spots in your community—glens, falls, caves, perhaps they can be floodlighted and made sources of revenue.

68 *Historical Spots—Monuments*—Floodlight these high spots in our history, to interest all who pass at night.

69 *Holiday Lighting*—In planning outdoor facilities, keep in mind Christmas effects that can be added easily.

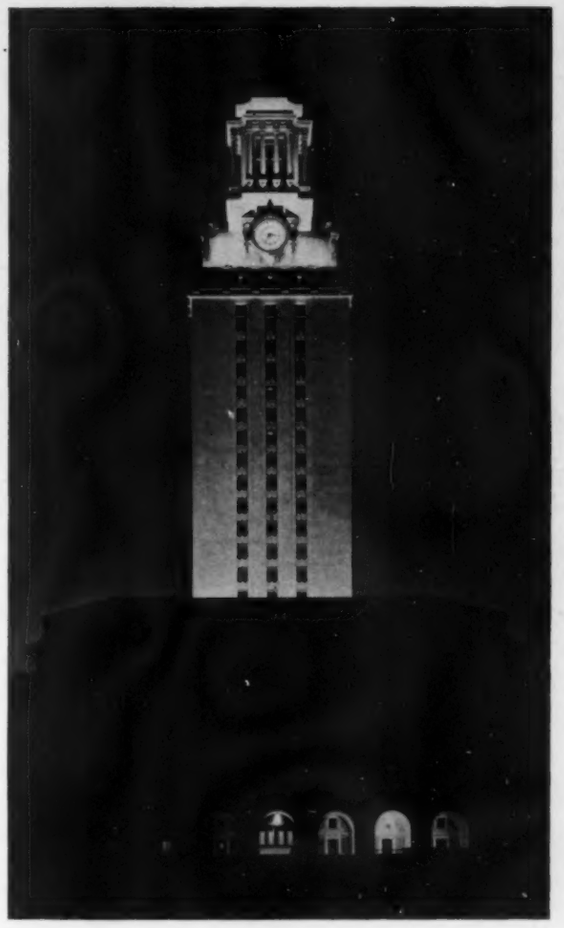
70 *Large Fountains*—Fountains in parks or on large estates justify careful study. Make the most of their possibilities.

71 *Band Shells and Platforms*—Good illumination of the area will give protection and comfort and help in locating scattered children and lost articles.

72 *Church Grounds*—Outdoor lighting can be planned for many games and other activities at night.

The SALES APPROACH

How to prepare and present your case to different kinds of prospects for outdoor lighting



CIVIC PRIDE *is stimulated by good floodlighting. Try city hall, libraries, university buildings.*

DESPITE the wide difference in types of prospects that go to make up the outdoor lighting field in any community, there are just three basic principles of approach to them all. First, because of its appeal to the larger number of people, is the "Gain and economy" inducement. In other instances the "Safety and protection" appeal exerts a strong influence. Finally, and important in many lighting recommendations, is the "Satisfaction and pride" appeal.

So the approach to each case must be analyzed at the outset to determine whether light can be employed to:

1. Save time or make working conditions safer or more convenient.
2. Increase business and profits by attracting favorable attention.
3. Make sports and recreational facilities available to more people.
4. Provide protection to persons and property from burglars or prowlers or reckless drivers.
5. Increase the pride of individuals or a community in the beauty of grounds and buildings.

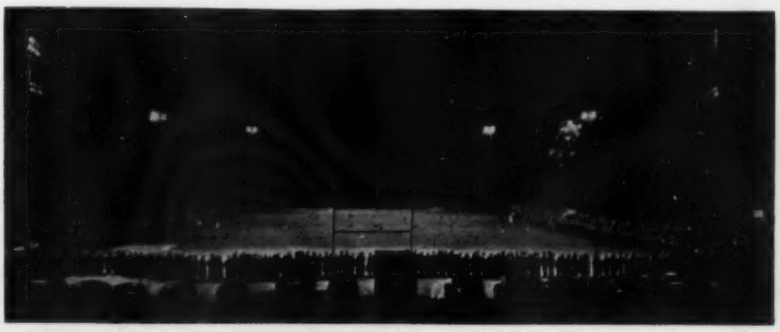
These few guiding factors provide a logical sales approach to merchants, owners of gasoline stations, industrial executives, civic groups, persons operating sports or amusement enterprises, public officials and home owners. The particular plan or detail of illumination, or the types of equipment remain secondary to the first step of establishing the need for a particular benefit from illumination. So first, make the prospect conscious of specific results to be derived from an improvement in existing conditions. The method of demonstrations, or detailed layouts and quotations to cover the ultimate lighting installation will follow in logical course.

Because uses differ, and because people buy for widely varying reasons, it is impossible to set down specific guidance to cover every type of outdoor lighting prospect. But here are the broad fields in which the general approach can be refined to fit the individual case that will confront you.

1. To Industrial Customers

Industrial plants must be shown how to save time or accidents for night workers, how to reduce thefts and to keep out prowlers. In addition, many plants are passing up good advertising opportunities through the lack of floodlighting on their main buildings, smoke stacks, water towers or other sites for night-time display.

Night scouting will suggest the plants where the best cases present themselves. Then day calls must present your recommendations to the night executive. For publicity lighting, get the advertising manager interested first, and show him what is needed to do an adequate job. Safety and protective lighting is of first concern to plant managers and superintendents. Pave your way by



COMMUNITY INTEREST *in night sports has brought a new and widening market for outdoor lighting, ripe for the contractor.*

having these men on your side before seeing those higher up.

2. To Commercial Customers

As an advertising medium, to attract the attention of crowds to a place of business, the use of floodlighting has proven its usefulness. It accentuates decorative features that distinguish one structure from the rest, and captures attention when no other means will. For the theater premiere, the store anniversary, or other similar events, floodlighting has proved its value.

But it is by means of carefully selected and appropriately designed permanent lighting effects that business is best able to make profitable use of outdoor lighting. And for each business, there is some individual problem to solve. It may be location near a competitor, the type of building occupied and its adaptability to lighting treatment, or something else that will provide the best approach to the subject, with a particular prospect. Each case must be studied individually. But there are certain kinds of customers that because of their common conditions can be considered as a class, such as—

A. *How to Sell Service Stations*—There are nearly 200,000 gas stations in the country, 90 per cent of them privately owned. How many are decently lighted? No one really knows, but a generous survey in several different areas indicated not more than one in fifteen. Yet service station lighting is show window lighting and store lighting rolled into one. The lighting attracts the trade, the same lighting enables the attendant to service the customer.

Since so many gas stations are individually owned, sales contacts must be made direct. Demonstrations are possible, but seldom worth while except for a chain. As in sports lighting, one or two units will not make an impressive showing and a full job is probably too expensive.

So talk in terms of rival stations. Talk equipment. Talk attraction results. Take your camera and snap a picture of the station in the daytime. Use ink to black out the daylight around the station. Touch up the station colors with crayon and for less than 15 cents you will have an impressive selling picture. The contrast of black and white will make the station more impressive, more outstanding, just as under actual night conditions.

B. *How to Sell Car Lots*—Used cars are sold largely at night, the leisure time of those who are in the market. The value of lighting parking lots depends on the type of trade. If it is wholly commercial there may be some doubt. Yet the busiest time of even these lots is from 4:45 to 6:00 p.m. when there is darkness for almost four months a year. Again if the district is a busy one, or has large theatrical crowds, the need for lighting is evident.

BLANK WALLS *go to work when good lighting makes them conspicuous. How many are waiting for your attention?*

GARDEN SPOTS *gain new beauty for evening enjoyment. One light or more will do the trick, but the wiring of the garden may be worthwhile.*

ROADSIDE STANDS *lose money when lighted this way. But floodlight them and the motorist sees and stops.*

Better light for these areas can be demonstrated and can be sold. The lighting problem is one of covering large areas and a successful demonstration over part of the lot merely means repetition for the entire area. The best selling tools are night photographs and light-meter readings on competitive lots, compared with a night view of the prospect's premises. A doctored picture showing the recommended installation and a trial installation will also help.

3. To the Recreational and Sports Field

The trend toward night-time enjoyment of various sports is increasing. This popularity has led already to an extensive use of outdoor lighting equipment. Municipal playground and school authorities have found lighting the sure means to increased player and spectator attendance. Night games are out-pulling those staged during the day. All this increases interest in better-grade lighting, and the public becomes more and more critical about its sports lighting. And where there is competition between clubs or fields, the approach is that of providing better, more scientific designs to please patrons.

Commercial projects can have only one type of appeal. The lighting equipment must furnish a means of increasing attendance at baseball, football or whatever it is. Or it must extend the participating time of paying customers for golf, driving or swimming pools. In approaching note these points—

Baseball: Do the customers come from a limited area, so that the number of people free in the afternoons is relatively small?

Football: Does a Saturday afternoon college or school game offer too much competition for a semi-pro game at the same time? In other words, income must increase over and above enlarged expenses. Quite generally it does.

Swimming: Are the evenings in summer consistently hot, so that relief would be welcome?

Golf Driving: Are the evenings so short or local courses so crowded that the average player cannot get in much golf except on week-ends?

The individuals operating such projects are not hard to contact. Their

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Get the benefits of a G-E time switch equipped with the precision motor of America's best-known electric clocks

General-purpose Type T-27

WHEN it comes to reliability—the kind of performance that protects your profits and satisfies your customers—a time switch is only as dependable as the motor that drives it.

That's why we build G-E time switches with Telechron motors. These motors are sealed in oil for quietness and long life; they're universally recognized for sturdy, day-after-day performance. And as for customer acceptance, almost a million of them were assembled in electric clocks last year alone. It's Telechron motor drive in G-E time switches that provides accurate timing, turns circuits on or off exactly when required, keeps power bills low. Its reputation can help you sell.

Other features add to the preference for G-E time switches, too. They're built for maintenance-free performance. Not only does the reliability of the drive avoid costly service calls, but quick-make, quick-break solid-silver contacts, ***conservatively*** rated at 35 amperes, offer added protection. Finally, from your own angle, G-E time switches are easy to wire. Just take a look at the space below the terminal block—notice the convenience of the five standard knockouts.

You can get further details by calling the nearest G-E office or by writing for Bulletin GEA-1427H. General Electric, Schenectady, N. Y.

SILVER CONTACTS—G-E time switches have silver-to-silver, self-aligning, self-cleaning contacts that resist oxidation. Quick-acting, extra-strong contact springs maintain positive contact and resist severe vibration

G-E MONOGRAM—The [illegible] that it's a G-E [illegible] means [illegible] acceptance of your wiring [illegible] G-E monogram on thousands of products has become a symbol of reliability. Customers know it means dependable service.

GENERAL ELECTRIC

440-122

business depends on meeting the public. Get your facts in order. Know about how much it is going to cost him per hour or per evening. Then present your case.

Private projects are more varied. The more exclusive club may feel that except for the swimming pool, night lighting is unnecessary because its members have ample time during daylight hours. However, there are many clubs —especially tennis clubs—which are faced with the problem of extending their facilities and yet have no ground or financial resources for enlarging.

The average tennis club enjoys its peak play in the evenings, which, except for mid-summer, are too short to take care of everyone. In most cases, the

FACTORIES BUY *yard lighting because it prevents accidents and shows up prowlers. Sell all your industrial customers.*

officers of such groups have never thought of lighting. Bring it up. Take them to some neighboring community where they can actually play under night conditions.

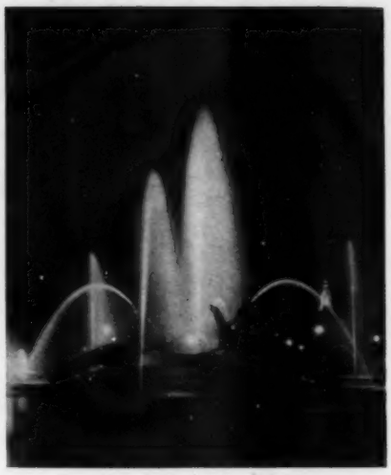
Never put in a trial installation for sports lighting. It will not be effective unless a complete job is done, and this will usually be too expensive as a sales method. A half lighted field or court is not impressive and will not aid the average prospect in visualizing the final job. But photographs of other clubs in use at night are very helpful.

The possibilities of business from public projects is largely a local problem. Some communities would expect their own maintenance force to do the work, others would have trouble arranging their budget. Success depends on the political set-up. You can be the only judge of these possibilities.

4. To Residential Customers

The appeal to home owners centers around provisions for greater security, increased enjoyment from lawns and gardens. The approach hinges upon learning at the outset—

1. If a neighborhood has had annoyance from prowlers and burglary.
2. In which of the larger homes, the men are frequently away during the evening hours.
3. Which large isolated homes are surrounded by heavy planting.
4. Where there are attractive gardens or other unusual features of the grounds adapted to lighting.
5. What areas suitable for sports lend themselves to development for night use.



PARK DISPLAYS, *such as illuminated fountains, can be made centers of evening interest by the right lighting.*

PUTTING PRACTICE *in the evening appeals to every golfer. So lights can be sold to every club and many home greens.*

5. To Civic and Public Areas

To visualize the needs in this field, you must explore your park areas, public buildings and grounds for outdoor lighting ideas. So here are the steps to take—

1. Check up the practical lighting needs around town as you see them, and make notes of these—where located, what for and whom to contact.
2. Set up these leads by groups as to

6. Location of ornate entrances, statuary, pools or fountains which need the touch of night-time illumination.

Then it becomes a matter of demonstrating the possibilities of these new resources for enjoyment, awakening the pride and enthusiasm of the prospect or selling him the additional security, as the case may be. Photographs of other installations will help.

structural floodlighting, play areas, pools or beaches, statues or monuments or whatever it is.

3. Identify the proper persons in charge of various types of property, then schedule calls to cover the list. Send literature to these persons. Keep them interested until you can see them.
4. Make demonstrations or show with photographs of similar lighting, what you propose to do.

ANNOUNCING

FLEX-O-LITE

TRADE MARK

The Ultra-Modern Tubular Fluorescent Lighting that Opens New Fields in

Fluorescent Illumination

Fluorescent Light Decoration

"The most startling and promising development that has been made in the Electrical Industry in recent years"—the opinion of the men in the Industry who have seen practical demonstrations of Flex-O-Lite.

New Exclusive Advantages

FLEX-O-LITE offers these advantages which have never before been possible with other types of lighting.

- Flex-O-Lite can be bent, with simple facilities, to any angle or contour.
- Flex-O-Lite brings new savings in power consumption.
- Flex-O-Lite gives an amazingly long life of efficient service.
- Flex-O-Lite is easily adapted to either direct or indirect lighting.
- Flex-O-Lite eliminates the necessity for conventional fixtures.

Flex-O-Lite is available in "Daylight White", and NINE additional colors.

You can have complete information on Flex-O-Lite, and judge for yourself the profit opportunities it offers. Simply send the coupon for your free copy of FLEX-O-LITE FACTS.

St. Charles Technical Laboratories, Inc.

R. A. Warren, *President* St. Charles, Ill.

This is Announcement No. 1

This is the first of a series of announcements of unusual importance to Electrical Contractors and Jobbers. Be sure you are on the mailing list to receive information in advance of each public announcement. Mail the coupon today.

TO GET THIS BOOKLET MAIL COUPON TODAY

ST. CHARLES TECHNICAL LABORATORIES, INC.
St. Charles, Illinois

Please send me a free copy of "FLEX-O-LITE FACTS," and place my name on your mailing list to receive advance announcements in the future.

Name .....

Company .....

Street .....

City ..... State .....

☐ Electrical Contractor ☐ Jobber

Some AIDS in SELLING

Don't be afraid of it . . . Stimulation of outdoor lighting depends on establishing contacts and presenting facts.

HOME SECURITY *is first in everybody's mind. Even the small backyard should be lighted and will be if you sell the idea.*

LAWN BOWLING *has its followers, too, and can be made popular wherever the greens are lighted and can be used at night.*

MANY factual tools for selling outdoor lighting are available. They range from technical information to your own data accumulated from day-to-day experience. But the most helpful preparation for selling in the average community embraces—

1. A fair appraisal of the prospects from whom you can look for maximum results.
2. A program that will bring steady contact with selected prospects.
3. Correct designing information to employ for various kinds of lighting.
4. Equipment with which to make demonstrations or temporary installations.
5. Instruments for checking present intensities and voltage conditions.
6. A portfolio of photographs and testimonial letters showing how it was done for others.
7. Proposals that cover the individual cases.

The Most Popular Fields—

While the whole field of outdoor lighting is rich in opportunities, every community lacks certain types of lighting more than others. Your own judgment must sift out of these the most logical prospects. From a recent analysis made by a manufacturer of outdoor lighting equipment, this listing shows the relative volume of sales to be—

1. Sports areas
2. Industrial yards and work areas
3. Service stations
4. Swimming pools and beaches
5. Parking and used car lots
6. Protective floodlighting
7. Construction projects
8. Specialty lighting

The above listing indicates clearly that there are many fields to explore aside from that of structural floodlighting. It will pay you to check up in your community. It will help you direct your sales activity.

Data to Guide You—

For every problem in outdoor lighting there is an abundance of technical data for you to use. Therefore, no attention is given here to installation methods. This information is already at hand in such well-known publications as—*Illumination Design Handbook* and the book *Artificial Light and its Application* published by Westinghouse Lamp staff, or the books *Illumination Design Data* and *Lighting Data Bulletins* from Nela Park. In addition to these useful guides, much literature has been prepared by manufacturers of equipment to cover these general applications—

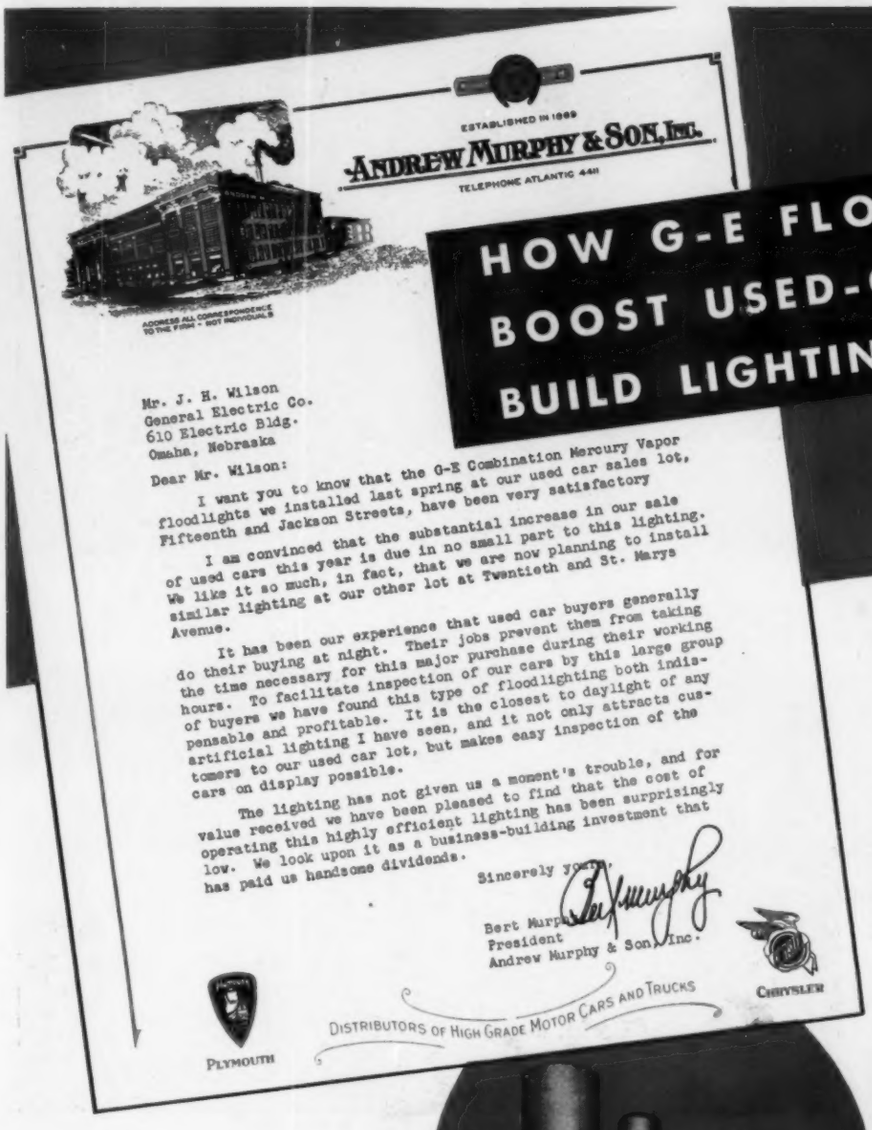
Automobile Trades—Lighting layouts for gasoline stations, parking lots and used car lots.

Outdoor Sports Lighting—Football, baseball and softball layouts are applicable for fields of varying size and for a wide range of lighting adequacy.

Other Sports—Such as golf driving ranges, horseshoe courts, handball, tennis, swimming pools, motor cycle racing plants and others. Much of this data is in the form of manuals, which provide detailed layouts, bills of material and data for wiring design.

General Floodlighting—Suggested applications for floodlighting projectors

HOW G-E FLOODLIGHTS BOOST USED-CAR SALES, BUILD LIGHTING BUSINESS



ESTABLISHED IN 1909

ANDREW MURPHY & SON, INC.

TELEPHONE ATLANTIC 4411

ADDRESS ALL CORRESPONDENCE TO THE FIRM - NOT INDIVIDUALS

Mr. J. H. Wilson
General Electric Co.
610 Electric Bldg.
Omaha, Nebraska

Dear Mr. Wilson:

I want you to know that the G-E Combination Mercury Vapor floodlights we installed last spring at our used car sales lot, Fifteenth and Jackson Streets, have been very satisfactory

I am convinced that the substantial increase in our sale of used cars this year is due in no small part to this lighting. We like it so much, in fact, that we are now planning to install similar lighting at our other lot at Twentieth and St. Marys Avenue.

It has been our experience that used car buyers generally do their buying at night. Their jobs prevent them from taking the time necessary for this major purchase during their working hours. To facilitate inspection of our cars by this large group of buyers we have found this type of floodlighting both indispensable and profitable. It is the closest to daylight of any artificial lighting I have seen, and it not only attracts customers to our used car lot, but makes easy inspection of the cars on display possible.

The lighting has not given us a moment's trouble, and for value received we have been pleased to find that the cost of operating this highly efficient lighting has been surprisingly low. We look upon it as a business-building investment that has paid us handsome dividends.

Sincerely yours,

Bert Murphy
President
Andrew Murphy & Son, Inc.

PLYMOUTH

DISTRIBUTORS OF HIGH GRADE MOTOR CARS AND TRUCKS

CHRYSLER

G-E MERCURY-INCANDESCENT floodlighting was a major factor in increasing the 1938 sales of Andrew Murphy and Son, Inc., Omaha, at its used-car lot. Mr. Bert Murphy, President, says, "We look upon it as a business-building investment that has paid us handsome dividends." Moreover, Mr. Murphy plans to floodlight another used-car lot with the same type of equipment.

If you use G-E floodlights, your customers, too, will be enthusiastic about their floodlighting. G-E floodlights are easy to install and to adjust; their sturdy construction assures long operation; and their neat, trim appearance makes them unobtrusive by day as well as useful at night. Try General Electric floodlights on your next job to gain the customer approval that brings more business. For further particulars write for a copy of our new catalog, "Novalux Floodlights." The coupon is for your convenience. General Electric, Schenectady, N. Y.

Type 148 mercury-incandescent floodlight

General Electric mercury-incandescent floodlights have won the approval of Mr. Bert Murphy for their illumination of the company's used-car lot

GENERAL ELECTRIC

General Electric
Dept. 6A-201
Schenectady, N. Y.

Please send me a copy of your new floodlighting catalog, "Novalux Floodlights" (GEA-1865C)

Name.....

Street.....

City..... *State*.....

500-339

MULTI

TWO-PIECE DOME

DIFFUSERS

. . . . . Put Money in Your Pocket . . . . .

Make friends of your prospects and you'll make more money. The Multi two-piece Dome Diffuser is the correct solution to well done, good looking, efficient installations. It is serviceable and lasting, gives modern lighting for shops, factories, work shops, etc.—rustproof—Multi Quick-change Grip-it Holder on globe prevents breakage and cracking from vibration or exposure. Learn more about this and other Multi Reflectors—write for catalog.

MULTI ELECTRICAL MFG. CO.
1840 W. 14TH ST. CHICAGO, ILL.

OAMCO REFLECTORS

No. 1168—wired
No. 1195—not wired

THERE'S MONEY IN RURAL LIGHTING

The OAMCO line of "Yardlights" (above) and Outdoor Floodlights (below) can be a source of good income for contractors. Rural districts and farm communities are becoming conscious of the need for these up-to-date lighting units. They are especially adapted to lighting areaways, yards, garages, alleyways, and many out-of-the way places on farms. Listed by Underwriters' Laboratories. Write for details on these and other OAMCO units.

No. 1139 Handy Floodlight

OVERBAGH & AYRES MFG. CO.
411 S. Clinton St. Chicago, Ill.

SOFTBALL—*This game attracts both men and women, and lighted fields bring demand for more of it.*

WATER SPORTS *in private pools are safer and more enjoyable when efficiently lighted. To public pools it brings popularity and more profit.*

cover the lighting of buildings, large signs, stacks, monuments and other wide areas—areas as employed in construction or railroad yards. Mounting suggestions, the use of color, and special control devices are also included to help you.

Garden and Protective Lighting—The many popular uses for outdoor light around the home have been assembled with pictures and sketches to illustrate what sizes of equipment to use, and where to place it for best results.

Fountains—From small fountains for homes to the larger units for estates and public places, there is data to guide you in planning.

Other Sales Tools

Having acquired the essential data with which to refresh your knowledge—to be sure you are following the latest standards of practice—then round out your selling facilities. Here are a few suggestions.

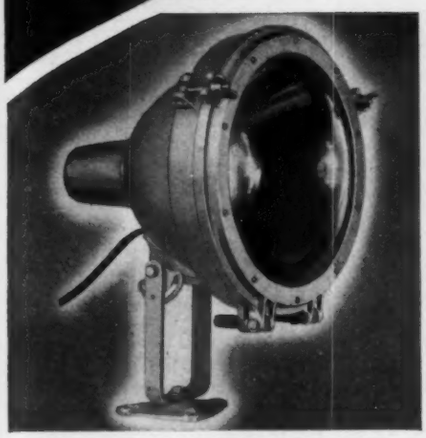
Sell with pictures—After you have studied the lighting needs, show your prospect good pictures. These should tell him quickly and clearly what you recommend. This is most effective when a few really good views are presented, with perhaps a few actual closeup photographs of the equipment itself. If you have "before-after" shots, assemble them under the group applying to a specific field. Avoid confusing the prospect with pictures that have no direct application to his need. Also try to assemble appropriate photos for selling smaller jobs. Don't scare these prospects with examples that are out of proportion.

So instead of using a half-dozen catalogues to confuse a customer, prepare a series of show books. Use loose-leaf sheets, large photos—one per page. Keep them filed so they can be assembled to suit your needs, so you can pick them out quickly on short notice.

Testimonial Letters—Obtain testimonial letters from every good job you have sold. Such letters serve as excellent proof to be used in sales presentations. Your customers are usually proud of these new installations and willing to state what benefits they have enjoyed since the new lighting was put in. Carry these letters in your sales portfolio.

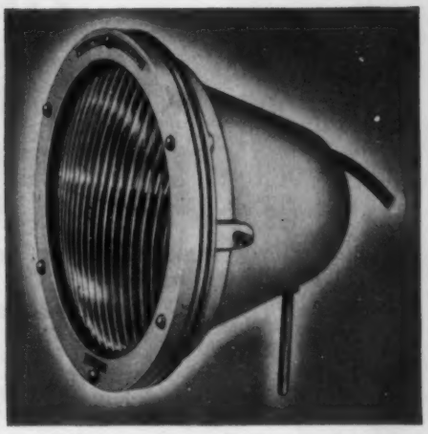
FLOODLIGHTING-

for every application!



CAK-16 De luxe for Decorative Building and Protective Floodlighting.

AFA-16 Porcelain Enamel Open Type for Parking Lots and Sportslighting.



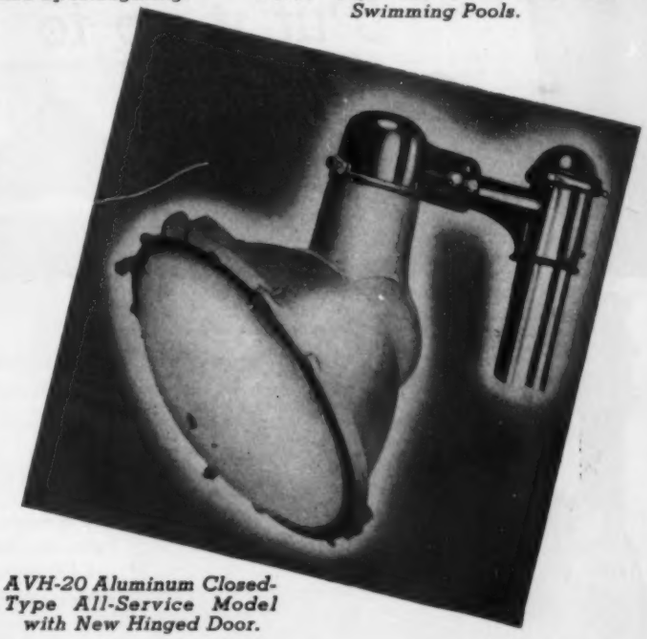
CS-10 New and Exclusive Underwater Unit for Fountains and Swimming Pools.

THE NEED FOR FLOODLIGHTING is recognized in a wide variety of applications; and the interest in extending these applications is mounting rapidly.

ELECTRICAL MEN EVERYWHERE are called upon, more and more, to install and maintain effective Floodlighting Systems . . . for Industrial Protection and Outdoor Industrial Operations; for Gasoline Service Stations and Parking Lots; for Community Playgrounds and Athletic Fields; and for many miscellaneous applications, including Real Estate Displays, Used-Car Areas, Barbecues, Roadside Stands; for Home Driveways and Back yard Games at night.

IT WILL PAY YOU TO SPECIFY WESTINGHOUSE, because Westinghouse makes 52 different types and sizes of Floodlighting Equipment, not to mention half a hundred reflector and lens combinations; and can furnish through its jobbers all wiring supplies and accessory equipment.

FOR FULL PARTICULARS and APPLICATION DATA, see your nearest Westinghouse Jobber today; or write to Westinghouse Electric & Manufacturing Company, Lighting Division, Edgewater Park, Cleveland, Ohio.



AVH-20 Aluminum Closed-Type All-Service Model with New Hinged Door.

THERE IS A WESTINGHOUSE FLOODLIGHT FOR EVERY APPLICATION

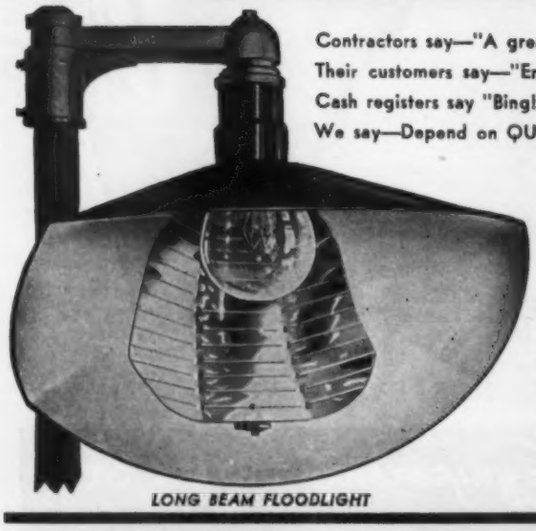
WHEN YOU THINK OF *Lighting Equipment* THINK OF

Westinghouse

FOR A BRIGHTER AND MORE PROFITABLE FLOODLIGHT BUSINESS

Put it up to

QUAD



LONG BEAM FLOODLIGHT

Contractors say—"A great line"
Their customers say—"Entirely satisfied"
Cash registers say "Bing! More Profit!"
We say—Depend on QUAD—see your Wholesaler

This complete line of Floodlights and Reflectors affords you full opportunity to meet all requests from your prospects for new and replacement lighting needs—indoor and outdoor—industrial and commercial. It's the line to stay with in 1939.

QUADRANGLE MFG. COMPANY
32 SO. PEORIA ST. CHICAGO, ILL.

Show them with pictures of the jobs you have installed.

Demonstration Units—Few types of major sports lighting lend themselves to trial installations, because a partial job does not show up well. However for other applications there are several ways to make good use of trial units.

Temporary or rental floodlights and reflectors may be employed to make demonstrations. Portable cable assemblies for convenient connections, and practical arrangements for fastening at desired mounting heights are time savers in setting up a trial lighting effect. It is necessary to have fittings and clamp-on accessories to suit varying conditions that are encountered, from steel and wood posts to trees and structural surfaces.

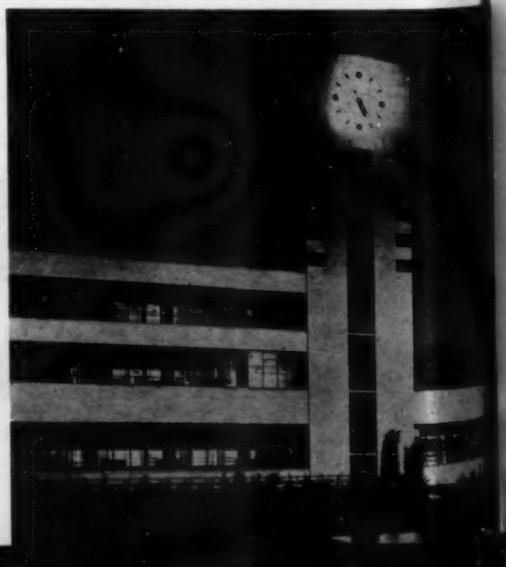
Instruments—The customer's existing system should be checked with a voltmeter to be sure that new lighting equipment will operate efficiently without excessive voltage loss. When voltage drops four per cent the lamp brilliancy goes down fifteen per cent. After all, the sale of additional lighting equipment involves wiring, and the results cannot be guaranteed if the adequacy of the wiring job is doubtful.

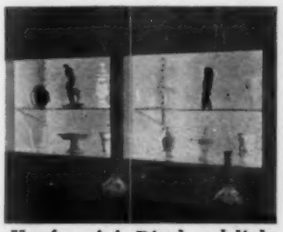
Since outdoor lighting of various types is definitely rated in units of intensity, one of the most important aids to selling better lighting is by checking the existing levels or foot candle intensities. There is no longer a mystery in foot-candle values. So use the light-meter as one of your valuable selling tools. Every prospect wants to know what is wrong with his lighting, and this is one sure way to translate his actual conditions.

Intensity Schedules

Don't guess or generalize about how much light is needed, in talking to a prospect. Assemble schedules of recommended foot-candles covering the types of lighting you propose to sell. Show these values as you present your case, cite the source of your data, as authoritative. And if you have done several jobs nearby that apply to the case, be sure to use all this favorable foot-candle data. It is a basis of comparison that will prove helpful to strengthen your sales argument.

ADVERTISING VALUE *waits in lighted towers that can be seen by traffic. Note the possibilities and sell the idea.*





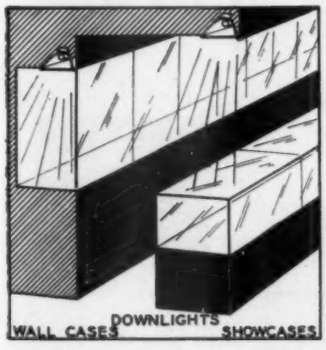
Kaufman's in Pittsburgh lights display niches with daylight fluorescent MAZDA *lamps.*

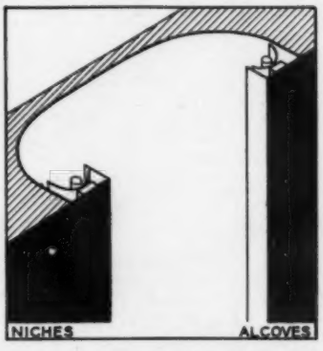
Roos Brothers' San Francisco store uses both fluorescent and incandescent lamps.

Perfumes and glassware sparkle in this fluorescent-lighted case at Linder Coy, Cleveland.

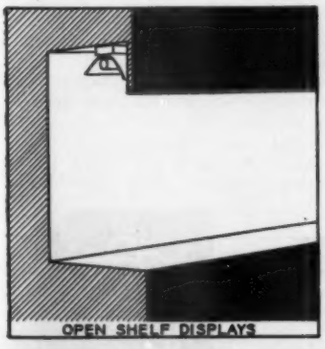
How electrical contractors are installing

"INDOOR DAYLIGHT" WITH THE NEW G-E FLUORESCENT MAZDA LAMPS





The two sketches shown above indicate several places where fluorescent lamps can be effectively used to give new display value to merchandise.



The sketches shown above illustrate how fluorescent lamps can be installed to provide ample lighting for open shelf displays and show windows.

ELECTRICAL contractors, dealers, and jobbers are discovering a profitable new source of revenue in the new General Electric Fluorescent MAZDA lamps. Using the daylight fluorescent lamps, they are installing "indoor daylight" in stores, shops, theatres, factories, and many other places.

For some time to come, the sale of these lamps will be limited to those channels that can handle the necessary installation work. That means you can make a double profit . . . from the sale of the lamps and from the installation work.

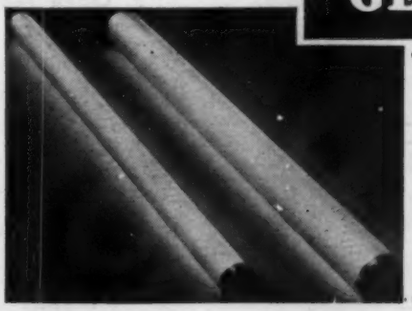
G-E Fluorescent MAZDA lamps give from 3 to 200 times more light than incandescent lamps of the same wattage and color . . . and for the same amount of light, they are 50% cooler. The daylight lamp gives the closest approach to real daylight ever produced at high efficiency. The colored lamps—red, gold, pink, blue, green, and warm white—offer wide opportunity for decorative installations.

For further information, write to General Electric Company, Dept. 166-EC-B, Nela Park, Cleveland, Ohio, or mail the coupon below.

TEAR OUT COUPON FOR USEFUL INFORMATION

• • •

G-E Fluorescent MAZDA *lamps are available in 18, 24, and 36-inch lengths and in several wattages. Because they are essentially arc lamps, they require special control equipment which is available.*



GENERAL ELECTRIC

General Electric Co., Dept. 166-EC-B,
Nela Park, Cleveland, Ohio.

Send me, without obligation, new free booklet giving information about G-E Fluorescent MAZDA lamps.

Name.....

Company.....

Street.....

City..... State.....

NIGHT CONSTRUCTION *is lighted up for safety and for speed as a matter of saving money. Every general contractor is interested.*

What to Use for Outdoor Lighting

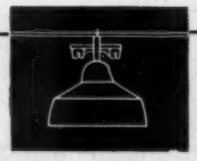
POPULAR demand for night sports, high intensity floodlighting of buildings and attraction lighting for gasoline service stations and parking lots has stimulated the development of much outdoor lighting equipment. Manufacturers have developed special designs to fit all kinds of outdoor lighting jobs. These lighting units may be conveniently classified as follows—

1. Enclosed Projectors

General service floodlighting units of heavy weather-proof construction, equipped with a reflector of silvered glass or polished metal and a weather-tight cover lens. These projectors are particularly suitable where close control of the light beam is necessary, as in floodlighting buildings from a distance, or narrow beam floodlighting of monuments or columns from below. Where lamps must be burned in exposed locations in all kinds of weather, or faced upward the cover lenses provide ample protection.

In floodlighting buildings these projectors are usually mounted in banks at a distance of 100 ft. or more from a comparatively low level, so that most of the light will be thrown upward. To provide contrast in the set backs on the upper stories additional floodlights are installed behind parapet walls below the set backs. Colored lenses or color screens and spill light control rings are usually available for this type of floodlighting unit.

For floodlighting buildings at close range from the curb line, where appearance is a prime consideration, a special type of floodlighting projector is available which resembles an ordinary street light unit in appearance. The ornamental globe is mounted on a curb standard. A reflector within the globe projects a wide angle beam in any desired direction. This type of unit diffuses a portion of the light over the sidewalk area.



2. Overhead Reflectors

For parking stations, used car lots or wherever overhead lighting is practical, dome reflectors with weather hoods designed for suspension from messenger cables, provide an effective and economical means of lighting outdoor areas. Types vary from porcelain enamel domes to deep bowl reflectors of the high mounting type in porcelain enamel or aluminum. Suspended from messenger cables over the area to be lighted the spacing and mounting heights may be arranged to give any desired foot candle intensity and light distribution.

3. Open Floodlights

A popular and efficient unit for many uses, the open type floodlight is available in many designs for handling a great variety of jobs. It consists of a weather-proof hood and mounting bracket, with a reflector of porcelain enamel or aluminum. Variations in the reflector form and the addition of supplementary reflectors provide a variety of light distribution curves for special applications.

These open type floodlight are light in weight, have wide angle beams, and are lower in price than the enclosed type floodlight. It is the almost uni-

FEATURE LIGHTING *gets more attention for some buildings than they receive by day. Look for possibilities in the architecture in your town.*

the unseen hand

...at makes this type of installation completely automati...

The modern, popular-priced Form KZ Astro-matic Dial Time-Switch.

The finishing touch on a modern display window lighting job is the installation of a Sangamo Time-Switch. From then on, punctual, automatic operation of the lights and sign is certain. Assured, too, is the loyalty and good-will of the store owner — because the Unseen Hand is designed, built, inspected, and tested to give trouble-free performance. After all, this is your best practical guarantee that you will not have to make profit-consuming service calls in the future.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

THE MOST VERSATILE TIME SWITCH ON THE MARKET!

MODEL 150-B
$15.00

★ Completely adjustable in steps of one-half hour.

★ Provides one, any number, or any combination of half-hour periods desired.

★ Can be connected to provide either open-circuit or closed-circuit periods.

★ Can also be connected for use as an adjustable single-pole, double-throw Time Switch.

★ Ideal for controlling heating, ventilating, air conditioning, or any other equipment in half-hour periods.

Write for Information

AUTOMATIC ELECTRIC MFG. CO.
MANKATO, MINNESOTA

HERWIG

OUT-DOOR
LIGHTING FIXTURES

Apartment Buildings
Public Buildings
Bungalows
Churches
Schools
Garages
Country Clubs
Warehouses
Residences

A FIXTURE FOR EVERY OUTDOOR PURPOSE

Send for our
CATALOGUE NO. 40
with NEW SUPPLEMENT
and REVISED PRICE LIST
200 Illustrations

The
Herwig Company
MANUFACTURERS
Established 1908
1753-59 Sedgwick Street
Chicago, Illinois, U. S. A.

NIGHT SALES *are vital to used car dealers. Good lighting draws in more prospects and helps show the cars.*

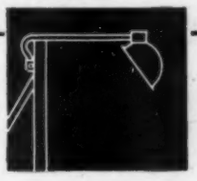
versal standard for gasoline stations, parking lots, and many types of sports lighting.

Other units have recently been developed to take combinations of incandescent lamps and mercury vapor lamps in the same reflector. They come in two or three sizes to mount from 300 to 1500-watt incandescent lamps. Specular reflectors behind the lamps provide a high intensity beam in some types for gasoline service station work. The beam may be focused to highlight the building besides providing general illumination over the drives. In sports lighting with the open type reflector, the reflectors are located as near to the playing area as is practical because of the wide angle beam.

4. Stand Lights

For gas station pump islands, parking lots, factory yards and similar outdoor applications, the stand light or column light has been developed. This unit consists of a dome reflector clamping a post, at a height of 10 to 15 ft. It provides a versatile outdoor work light with characteristics similar to the popular RLM reflector.

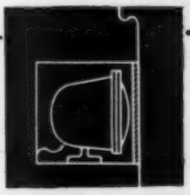
In gas stations, these units are usually located at the pump island as work lights. In parking stations they are used along the bumper rails. In areaways and platforms they may be mounted on brackets attached to a building. A variation of this unit includes a wide angle floodlight on top of a stand light, providing gas station pump island lighting plus close-up floodlighting of the building.



5. Sign Reflectors

For billboards, service station signs and similar specialized applications, sign reflectors with weather-proof socket housings and porcelain enamel reflecting surface are available in many forms. They are designed to permit even intensity distributed over the face of the sign from close range with a sharp cut-off near the edges of the sign.

Elliptical, rectangular and round types of sign reflectors, for angle mounting, are available to fit most standard poster sign and emblem sign lighting jobs. The manufacturers of sign reflectors usually provide detailed mounting dimension information. If followed correctly, this will give the even light distribution qualities which has been built into these reflectors.

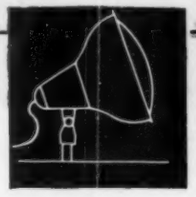


6. Under Water Lighting Units

For outdoor swimming pools, water tight projectors below the surface of the pool may be set in niches in the pool walls about 12 to 18 inches below the water surface. These units are

usually 300 to 500 watts, spaced on 12 ft. centers or less and equipped with spread lenses. Water tight wiring connections are brought up to a "dry" splice box above the water level. Such underwater lighting equipment is designed to withstand the chemical effects of chlorine, salts and other corrosive substances found in swimming pools.

For illuminating fountains the same types of unit may be provided with concentrating beam lenses and reflectors and equipped with color filters or colored lenses.



7. Portable Floodlights

For the temporary floodlighting of real estate developments, houses for sale, garden parties, outdoor displays and similar uses, the small portable reflector is a versatile unit. These units are available up to 500 watts with flexible mounting and glass covers. Mounting brackets are equipped with universal type clamps, which make it possible to mount the floodlights in any position.

TOBOGGAN SLIDES *and ski jumps, with the contractor's help can double their hours of operation.*

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—MUCH EASIER TO SERVICE

● If you want good illumination, your reflectors must be removed now and then for cleaning. Make an easier job of it with the Diskonect—released or attached in an instant without fussing with tools or wiring. You needn't twist, tug or force. There's nothing to corrode or stick. It's all done with a simple, spring-set plunger in the hood which releases or locks the reflector and lamp as a unit. Diskonect Reflectors are offered in a variety of styles and sizes—an exclusive Goodrich feature.

"As the simplest detachable reflector on the market, the Diskonect sells on demonstration. Take advantage of its growing popularity to make extra profits. Ask for complete information."

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WINTER HOCKEY *can be profitably played across the northern states. Lighting brings night crowds.*

The WIRING SIDE of It...

The Wiring Side of It . . . Outdoor lighting jobs require well planned and properly executed wiring if it is to work efficiently. This fact strengthens the contractor's claim to the whole job in this market.

ASIDE from giving the proper lighting effects, every installation of outdoor lighting must depend for its success upon the contractor's skill. So in selling light for outdoor uses, the order always should include these features—

1. *Adequate Copper* — to carry enough power for correct lighting efficiency.
2. *Correct Location* of units to provide uniform distribution and provide the desired effects in all lighted areas.
3. *Neat Appearance* of installed equipment and its wiring in daytime.
4. *Permanent Installation* which will not sag, lean or become otherwise unsightly after normal exposure to wind, sleet and corrosion.
5. *Maintenance Costs* to be kept low through the choice of high grade equipment and by good installation methods which provide protection against mechanical damage.
6. *Practical Control* methods that add to convenience and safety in operating the outdoor lighting system.
7. *Continuity of Service* assured without annoyance and danger of overloading the general wiring system to which outdoor lighting is often added.

Some general guides to the wiring design problems involved in outdoor lighting systems are given below. These points will need to be developed in full detail by the contractor to fulfill local code requirements. With good installation and design methods once established for the various types of outdoor lighting, however, the contractor is master of the situation.

The wiring job for outdoor lighting has, as a rule, different design conditions than the wiring of a home school or factory. First, the total load is a known factor. Second, the wiring system is usually designed to fit the actual connected load without allowances for adding future equipment. A third characteristic is the absence of diversity calculations in wiring layouts. When operating at all, the system operates at full capacity.

So in laying out the job, the principal

problem is to provide adequate voltage at an economical cost for wiring and maintenance.

High Tension Distribution—This is a practical system for loads in excess of 50 K.W., such as large banks of floodlights grouped at a distance from the service entrance with transformers located at the floodlight banks. It is usually applied to baseball fields, football stadiums, large bathing beaches, office building floodlighting and similar heavy load jobs.

Secondary Voltage Distribution—This is employed for most small floodlighting jobs and the great majority of outdoor lighting installations, for example:

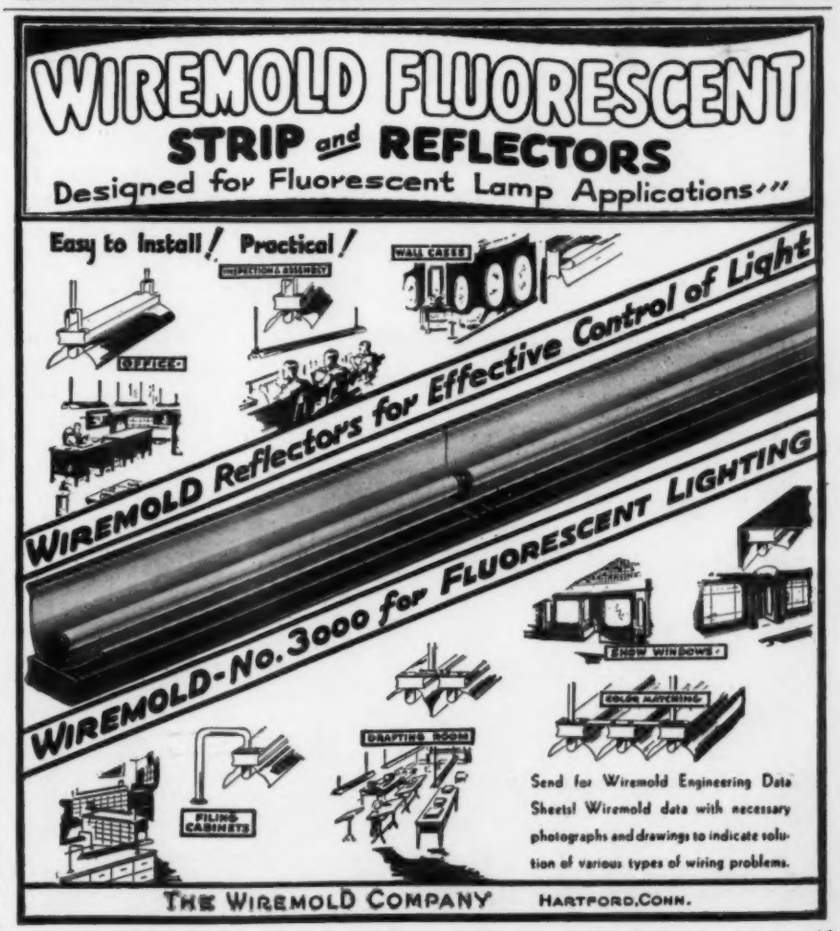
Gasoline Service Stations require a rugged trouble-free, wiring system of neat appearance. Lead covered wire and galvanized conduit placed underground between the building and the pump islands and floodlight poles are standard practice for wiring this type of job.

Parking Lots and Used Car Lots are apt to be of a less permanent nature than the gasoline service stations. Therefore, the wiring systems often employ cheaper methods. Where steel poles are used, underground cable is terminated at the base of the pole and rubber covered wires extended inside of the pole into the floodlight hood. Where reflectors are suspended on messenger cables the circuit conductors are strung exposed on insulators, which are a part of the suspension bracket.

Outdoor Sports Area wiring will vary with the kind of play and location. Softball fields, tennis courts, swimming pools, skating rinks, race tracks, horse shoe pitching courts, skeet shoots and other sports may be played on a sand lot or on the grounds of an exclusive country club. The consideration of adequate wire sizes and voltage drop, however, is important as on all sport lighting jobs.

Layouts for outdoor wiring systems require a preliminary sketch showing the location of lights, height of poles, and point of service entrance. The distribution circuits may then be laid out, scaled off, and listed with the loads they serve. With this data the correct wire size can then be calculated.

On systems where operation is intermittent, the cost of wiring represents a fixed charge which the owner is justified in keeping at a minimum. However, the cost of a single breakdown may far exceed the cost of proper design and circuit protective equipment in the original installation. So the wiring problem is vital to outdoor lighting and since you sell modern equipment, set up an equally high standard for the wiring on which it is to operate. Properly explained, it will prove to be an important aid to your selling.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WIREMOLD Reflectors for Effective Control of Light
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Send for Wiremold Engineering Data Sheets! Wiremold data with necessary photographs and drawings to indicate solution of various types of wiring problems.
THE WIREMOLD COMPANY HARTFORD, CONN.

WIRING Methods

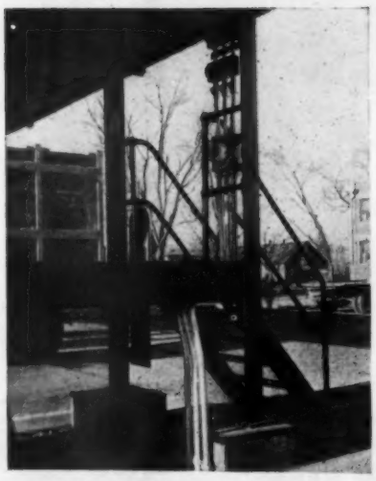
DRIVE-IN LOADING—Enlarged shop arranged for trucks to load heavy pipe direct from stock bins.

SIGNALS FOR BULK GASOLINE PUMPS

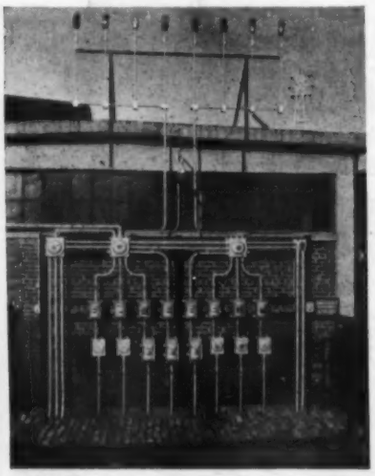
Safety is the watchword at the new Socony-Vacuum bulk gasoline plant in Hartford. A 100 per cent explosion-proof wiring system was installed, which includes a set of color-coded signals to indicate the operation of various pumps.

This plant has six sets of push button stations at loading platforms, for the remote control of eight motors for gasoline pumps that are grouped in the plant yard. Atop a centrally-located building of this plant are eight 100-watt glass globes. When a pump motor is operating, its corresponding lighted signal is visible from the various control points.

There are four red, two green, one amber and one clear glass globes in this group. All remote control stations have colored buttons to correspond with the signalling color scheme.



REMOTE CONTROL—Six sets of explosion proof motor control buttons at loading platforms save steps for workers in a bulk gasoline plant.



MOTOR SIGNAL—Colored glass globes above explosion-proof starter group indicate which of eight pump motors is operating.

The Booma-Gruener Electric Company, Inc., of Hartford, designed and installed the complete system. The signals may be seen extending up from the grouped arrangement of explosion-proof enclosures for circuit breakers and magnetic starters of the pump motors. All racking was done on fabricated steel members. Between each signal lamp and its junction fitting there is a sealing fitting, and one also in each main connecting conduit that was extended up from the motor control group. After these photographs were taken the signal lamp fittings were reconnected to place the lamps tip-down. This change provides better protection against rain seepage through the globe gaskets.

CONDUIT HOUSEKEEPING

Quick and easy handling of large conduit orders speeds the daily routine for the W. W. Ingalls Electric Company in Miami, Florida. Trucks can drive alongside the tiers of stacked conduit for loading. This contracting firm keeps a carload or more of conduit in stock at headquarters, besides a larger quantity of bulk stock in its auxiliary warehouse.

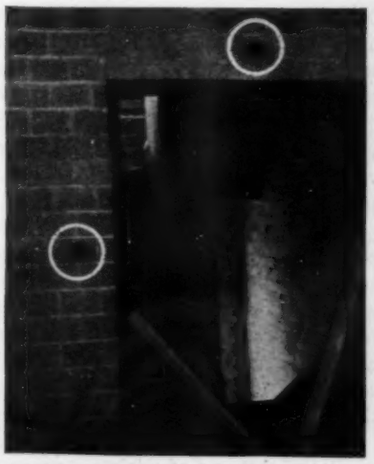
During a recent enlargement of its building, the floor layout was arranged to provide a clear truck aisle lengthwise of the shop. Now the company's cars can be driven in through front or rear doors, and bundles of assorted conduit sizes as needed for a large job may be loaded from any stack with minimum handling.

Storage racks for ladders, heavy benches and pipe tools are also arranged near the drive-through aisle to simplify loading up for heavy rush jobs. This clear space provides convenient night storage berths for the company's trucks.

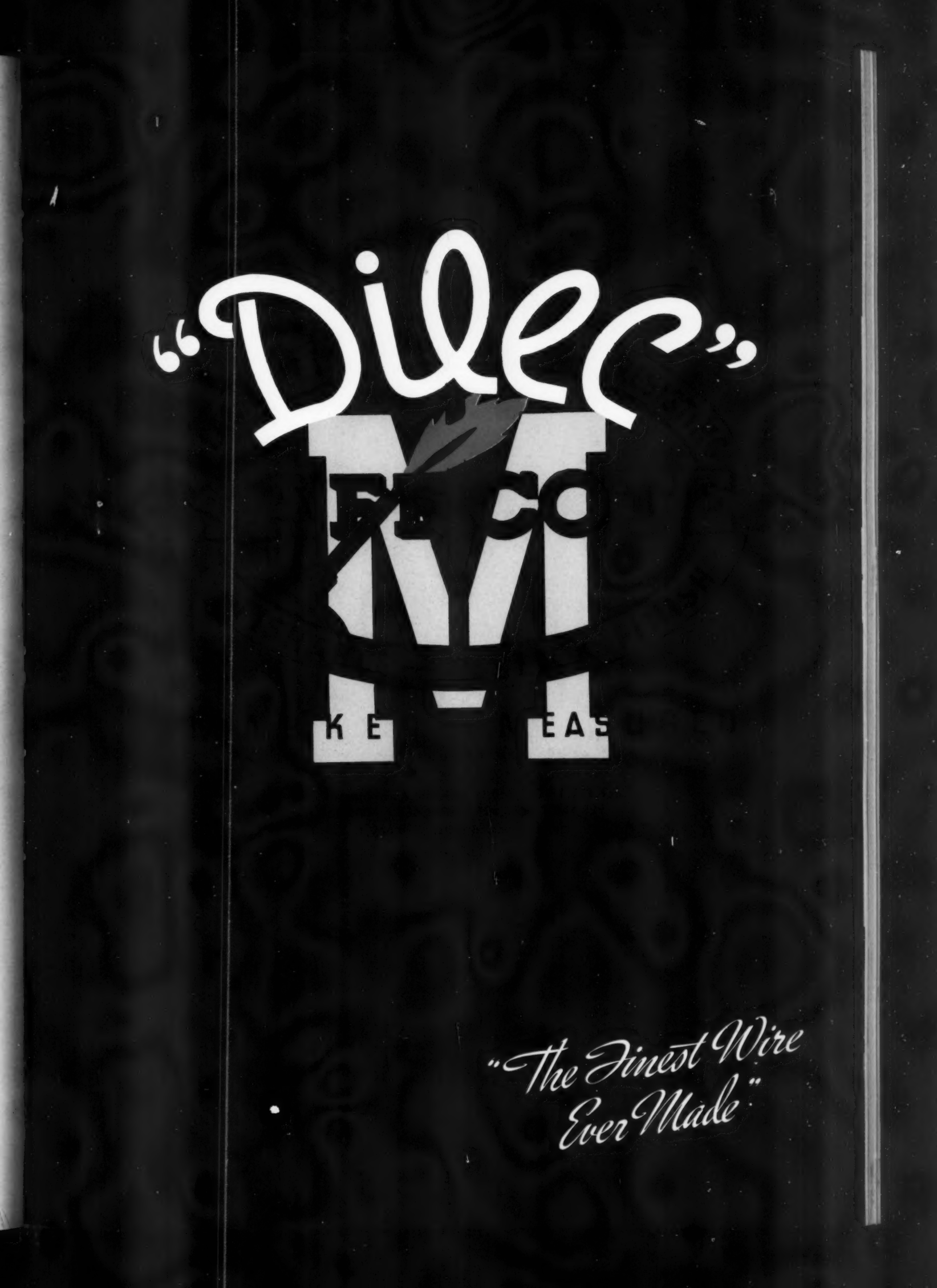
SIDE OUTLETS IN TILE

Switch and other wall outlets installed in the new Indianapolis Clinic Building by the C. L. Smith Electric Company of Indianapolis, Ind. were ingeniously built to exactly match the adjoining tile and thus the common difficulty of making a neat installation in this kind of partitions was solved.

The boxes were made up to match the size of a single 5 x 8 x 4 inch tile with the usual switch box size opening cut in the face. The boxes were then painted and finished to match the color and texture of the tile, and mortared into a regular tile course. The similarity is so well carried out that very close examination is necessary to detect the difference.



WALL OUTLETS with boxes. The covers were made and finished to match exactly the tiles in size and color.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Ever Made"

National

RUBBER M COVERED
WIRES AND CABLES

"The finest

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National SAFECOTE R 600V 14

Cut out center, pull out as wanted . . . . every marker >|<-----|< measures two feet. 14 to 2,000,000 CM marked with size, type, voltage . . . measure marked >|< easiest fishing wire available

Never kinks when pulled from center

>|<

Boxes keep wire clean

>|<

Marker measures every two feet as pulled out

>|<

Box has space for marking amount taken out

Slick, Patent Leather-like finish, clean

wire ever made"

MEASURED

without additional cost

Packed to naturally uncoil from center without kinking

Recoils as you count the marker every two feet

Clean to handle

Slick, lubricated, fishable finish makes your job a pleasure

Bright, strong colors

Identified and Measured every two feet

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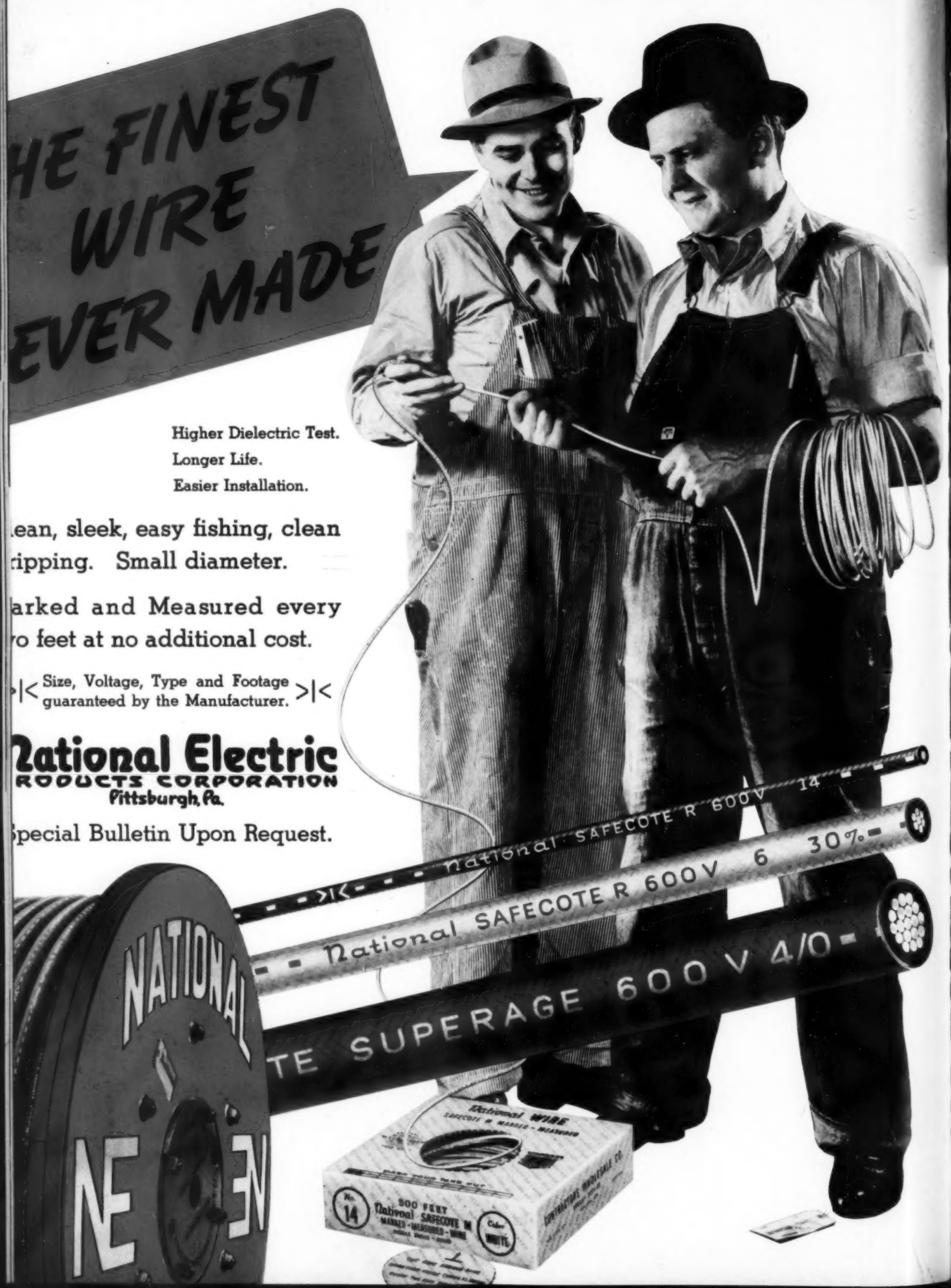
NE
WIRING SYSTEMS 6
WIRES AND CABLES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ELECTRICAL

Maintenance

INDUSTRIAL AND COMMERCIAL

SIGNALING TO YOU

WORKING conditions and employee welfare mean more today in any factory than in past years. Public relations have become management's Problem No. 1—and public relations start with employee relations.

Take signaling, for instance—and plant communication equipment. There will be more of it used—for safety, for convenience, for contact. Some companies now broadcast music to keep certain kinds of workers cheerful. It is well, therefore, for every maintenance department to be well posted in developments in this field.

This article—13 in the series of Maintenance Guide Sheets—reviews the background facts and presents a check chart for trouble in the low voltage lines.

This series of articles began in January, 1938, with a frank review of the electrical maintenance man's job. Then came—

1. ALTERNATING CURRENT MOTORS—Types and Applications
2. DIRECT CURRENT MOTORS—Types and Applications
3. ALTERNATING CURRENT MOTORS—Maintenance
4. DIRECT CURRENT MOTORS—Maintenance
5. A.C. MOTOR STARTERS AND CONTROLLERS—Types and Applications
6. D.C. MOTOR STARTERS AND CONTROLLERS—Types and Applications
7. MAINTENANCE OF CONTROL EQUIPMENT
8. SPECIAL CONTROL PROBLEMS — Heavy Installations and Maintenance
9. ELECTRIC DISTRIBUTION—Circuit Protection—Power Factor Correction
10. LIGHTING — Applications and Maintenance
11. ELECTRIC HEAT — Types, Applications and Maintenance
12. ELECTRIC WELDING — Types, Applications, Control
13. INTERPLANT COMMUNICATION—Types and Common Maintenance Problems (this issue)

Coming articles will discuss

14. INSTRUMENTS—Types, Application, Care
15. POWER TOOLS—Types, Application, Care
16. BATTERIES AND RECTIFIERS—Types and Maintenance
17. ELECTROPLATING — Maintenance Aspects
18. ELECTRONIC DEVICES—Types and Applications

Plant Signaling and Communicating Equipment

Application and Maintenance of Devices and Systems for General Use

ESSENTIALLY there are two general kinds of signals—audible and visual. The audible system may employ telephones, bells, horns, or other devices. The visual system is obviously one that flashes light signals arranged by color or numeral codes. Where to apply a particular type of signal, how to coordinate it into a general system, what control to employ, the source of energy and methods of installation, are all problems which in one way or another affect the future maintenance of signaling equipment.

Since the electrical maintenance man is responsible for the operation of signaling systems, and must also alter and enlarge them to meet changing conditions, some of the following systems will usually be a part of his work:

Drop and lamp annunciators
Bell and gong systems
Sound amplification systems
Fire alarms
Burglar alarms
Clock systems
Watchman reporting systems
Inter plant telephones

To simplify the maintenance work connected with larger signaling systems and to have them render the service for which they are intended, the maintenance department must be thoroughly informed regarding each system's design and the operating details of each kind of a device in use. To make this possible the electrical maintenance man should have:

1. A record of the equipment installed.

2. A plan of wiring which gives the location of signaling devices, telephones, and junction boxes.

3. A general wiring scheme, particularly for interconnecting the various telephones.

4. A maintenance manual containing color codes, signal codes, circuits of signaling devices and telephone instruments.

5. Suitable test equipment for checking the circuits.

Although a number of signaling and telephone systems operate on low-voltage circuits, their installations are governed by rules and regulations of the National Electrical Code 1937, Article 800. The maintenance man should be familiar with this part of the code.

"HE IS SOMEWHERE IN THE PLANT."—*So he was paged by the code call system (transmitter to the right of switchboard), and the telephone call was completed on the extension to Dept. C. (S. H. Couch Co. photo.)*

DISPATCHER TO SHIPPER — *Loud-speaker systems facilitate issuing, checking, and last minute instructions. Some systems permit two-way conversation. (The Doorman Mfg. Co. photo.)*

Signaling Systems

Drop and lamp annunciators are used usually in quiet locations such as offices. Magnetic drops or lamps in the annunciator are energized by respective push-buttons located at various stations (rooms or desks). Audible signals may be included with drop annunciators. Magnetic drop systems are operated at low voltage. Lamp systems are available for low voltage or 110 volts.

Bell, chime, gong, horn and other systems with audible signaling devices are used most often in noisy locations. The signaling devices are available for coded or non-coded paging systems and are operated generally on low voltage.

These forms of paging systems are operated from central manual or mechanical-code calling equipments.

Sound amplification systems use vacuum tube equipment and loud-speakers. Applications are in stockrooms, warehouses, shipping and receiving departments and the like. Equipment is available for two-way conversation, which permits calls being answered at a distance from the instrument. Single speaker-microphones can cover an area of 5,000 sq.ft. Answers can be given at distances up to 50 ft. from the instrument.

This form of paging system consists of a small master station installed usually at a telephone switchboard or in a dispatcher's office, and a number of loud-speakers at outlying locations.

Fire alarm systems operated on closed-circuits are to be recommended. These are supervised systems, and are approved in general by the National Board of Fire Underwriters. On these supervised systems, a small trouble bell rings continuously when power supply fails or when the circuit is opened at any point.

The several types of supervised systems are: non-code, box code, box-code pre-signal, and box-code with connection to a municipal fire department system; also automatic systems with thermal detectors installed at suitable locations, such as sprinkler systems.

Open-circuit, non-code, non-supervised systems have only a few alarm devices. They are open to the objection that if for any reason the system becomes inoperative, there is no means of ascertaining this condition other than by making a test at each station.

Burglar alarm systems consist essentially of one or more contact-making devices or photronic light beams which establish circuits to actuate one or more alarm devices. The alarm devices, either audible or visual, are located generally on the premises. Alarm signals can be transmitted to an annunciator in the plant, or over a leased wire to a central office. The devices are available for operation on low-voltage or 115-125 volts d.c. or a.c. lighting circuits.

Clock systems in general are:

1 *Synchronous motor clocks with no central control,* and connected to 110-115 volt a.c. circuits. Each clock must be reset individually. Special clock circuits should be provided to prevent stoppage because of blown fuses.

2 *Synchronous motor clocks with master resetting control* require a frequency changer or a dual motor on each clock so that the clock operation can be speeded up to compensate for interruptions. To provide for service interruptions an emergency battery and a d.c.-a.c. motor-generator set should be installed.

3 *Master and secondary clock system* employs a master clock which sends out impulses once each hour to bring all secondary clocks into exact synchronism. One manufacturer uses 24-volt circuits to the secondary clocks.

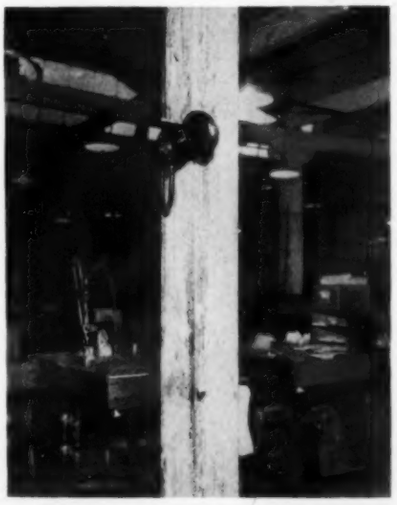
4 *Time stamps and employees' time recorders* may be operated by synchronous motor clocks or as secondary clocks actuated by a master clock.

Watchman systems have three general types:

1 *Battery type* with time detector and with or without clock. A closed-circuit supervised system is recognized by leading insurance rating authorities.

2 *Magneto type* with time detector and with or without clock, also with detector and annunciator. A magneto is cranked by the watchman and an impulse actuates a magnetic device at the central detector. No power is required except when a synchronous motor clock is included with the time detector. Annunciators are used as a part of the central recorder for visual indication to the watchman to determine whether all stations were visited and recorded.

3 *Leased-wire supervisory system* usually furnished under a lease to provide a record at a central headquarters of watchman tours. On large systems only each tenth station is electrically connected. The



AUDIBLE SIGNALING DEVICES *with distinctive tones are selected for use where operations are noisy. Here a horn serves for paging individuals. (Benjamin Electric Mfg. Co. photo.)*

TROUBLE CORRECTION CHART FOR SIGNALLING EQUIPMENT

TROUBLE	CAUSE	REMEDY
AUDIBLE PAGING SYSTEMS (BELL AND GONG)		
Ringing trouble general throughout system.	Weak battery, blown fuses, defective transformer. Loose terminal connections. Defective contact springs at transmitting station. Open, short-circuited or grounded feeder and section wires.	Charge or replace battery, renew fuses, or replace transformer. Clean and tighten connections. Adjust springs. Test and correct wiring.
Ringing trouble limited to part of system.	Dirty and pitted contacts. Sticking of striking plungers. Loose terminal connections. Open circuit in solenoid. Sticking armature. Open, short-circuited or grounded wires.	Clean, smooth and adjust contacts. Remove dust, lint. Renew warped insulating plunger tube. Clean and tighten connections. Replace solenoid. Adjust spring or replace shading ring on ends of electromagnet core. Test and correct wiring.
More than required number of bells operate at same time.	Multiple pushbutton stick, or contact springs broken. Grounded, short-circuited or crossed section wires.	Provide free movement for pushbuttons, or renew contact springs. Test and correct wiring.
VISIBLE SYSTEMS (ANNUNCIATORS)		
Drops and lamps, in general, do not operate.	Weak battery, defective battery eliminator, defective transformer, or "blown" fuse. Grounded, open or short-circuited feed wires from power supply. Loose connections on feeder. Broken common wires to keyboard, coils of relays, or flasher.	Charge or replace battery, correct defect on eliminator, replace transformer, or renew fuse. Test wiring and correct. Clean and tighten connections. Check wiring and correct.
Certain drops and lamps fail to operate.	Weak battery. Dirty drop pivots. Sticking armatures. Open circuit in drop magnets. Defective pushbutton contacts. Defective contacts on multiple circuit type motor driven flasher. Grounded, open, or short-circuited section or common wire. Defective lamp receptacles. Burned out or defective lamps.	Charge or replace battery. Thoroughly clean pivots. Free and adjust armatures. Test drop magnets and correct. Clean and adjust contacts. Clean and adjust contacts. Check and correct wiring. Adjust or replace receptacles. Replace lamps.
Lamp signal dim.	Old lamp, ready to burn out. Weak battery, defective eliminator, or defective transformer. Grounded or crossed section wires.	Replace lamp. Charge or replace battery, correct defect in eliminator, or replace transformer. Test and correct wiring.
More than required number of lamps burn at same time.	Crossed, grounded or short-circuited section wires. Broken or poorly adjusted contact springs on multiple pushbuttons. Loose wires at terminals and on distribution blocks contacting other terminals.	Test and correct wiring. Renew or adjust springs. Adjust wires on proper terminals and tighten all connections.
Lamp fails to extinguish.	Short-circuited or grounded wires. Defective control key or switch does not open circuit after being operated. "Frozen" armature or sticking contacts on relay. Defective flasher contacts.	Test and correct wiring. Check springs and contacts; adjust and replace if necessary. Loosen, clean and adjust armature and contacts. Clean and adjust contacts.
FIRE ALARM SYSTEMS (CLOSED CIRCUIT TYPE)		
Alarm bells do not ring but trouble bells ring.	Weak battery or "blown" fuses supplying operating current. Open or short-circuited feeder wire on operating circuit. Time limit cut-out open. Station circuit open or grounded. Milliameter reading below normal or zero.	Charge or replace battery or renew fuses. Test and correct wiring. Return to normal position. Test and correct circuit. Check both bell and station circuits for openings and correct.
FIRE ALARM SYSTEMS (CLOSED CIRCUIT TYPE) Cont'd		
Alarm and trouble bells do not operate.	Weak battery or "blown" fuses supplying both operating and supervisory current. Open or short-circuited feeder wires between service and control panel.	Charge or replace battery, or renew fuses. Test and correct feeders.
Alarm bells ring but trouble bells do not ring.	Weak battery or "blown" fuses supplying supervisory current. Open or short-circuited feeder wire on supervisory circuit. Poor connection of trouble bell relay contact springs. Loose terminal connections on trouble bells and relay.	Charge or replace battery, or renew fuses. Test and correct feeder wire. Adjust springs. Clean and tighten connections.
INTERCOMMUNICATING TELEPHONE SYSTEMS		
Ringing trouble general throughout system.	Weak "ringing" battery, defective battery eliminator, defective transformer, or "blown" fuses. Grounded, open, or short-circuited common ringing battery wires. Bells out of adjustment.	Charge or replace battery, correct or replace battery eliminator or transformer, or renew fuses. Test and correct wiring. Adjust bells.
Ringing trouble limited to part of system.	Bells have dirty contacts, or pitted contacts because of excessive voltage. Armature rests against magnet cores. Defective adjustment between contact screw and spring. Loose terminal connections. Open electromagnet circuits. Defective contact between springs for push-buttons. Defective normally closed circuit contact springs on receiver hook connected to bell.	Remove dust and oxidation, smooth contacts, check for excessive voltage. Adjust spring. Correct adjustment. Clean and tighten connections. Check and correct. Adjust springs. Clean contacts and adjust springs.
Talking or hearing trouble throughout system.	Weak "talking" battery, battery eliminator, or "blown" fuses. Grounded, open, or short-circuited common-talking or battery wires. Defective retardation coil at battery.	Charge or replace battery, correct or replace eliminator or renew fuses. Test and correct wiring. Check and correct.
Talking trouble limited to part of system.	Transmitter circuit open or short-circuited. Defective "talking" contact springs in receiver hook.	Test and correct. Clean contacts and adjust springs.
Hearing trouble limited to part of system.	Receiver and receiver cord open or short-circuited. Receiver diaphragm dented, irregular in shape, or iron dust accumulated on magnet poles. Defective "talking" contact springs in receiver hook, and pushbutton contacts.	Test and correct. Renew diaphragm and clean all parts. Check, clean and correct; renew if necessary.
Noisy talking circuit general throughout system.	Grounded circuit. Too high voltage to transmitter from "talking" battery or eliminator. Weak or "dead" cell in battery. Loose connections on "talking" battery eliminator, or on battery wire.	Test and correct circuit. Reduce voltage to proper value. Renew battery. Clean and tighten all connections.
Noisy talking circuit limited to part of system.	Broken wire in receiver cord. Loose connections in telephones and wiring. Defective "talking" contact springs in receiver hook, or defective connections at "talking" circuit buttons, jacks, or key contacts.	Replace cord. Clean and tighten all connections. Check, clean and correct.
More than required number of stations called at same time.	Grounded, short-circuited or crossed section wires. Crossed wires in telephone instrument. Defective insulation of section wires at damp places, causing short-circuit or ground. Multiple pushbuttons stick, or contact springs broken. Contact springs crossed by solder, bare wire or other metallic object.	Test and correct wiring. Check and correct. Inspect thoroughly, test and correct all section wires. Provide free movement for pushbuttons, or renew contact springs. Clean and clear contact springs.

WIRE SIZES ON 12 AND 24 VOLT SYSTEMS

Length of Circuit (One-way Distances)	12 Volt Systems Load in Amperes							24 Volt Systems Load in Amperes						
	0.5 Amp.	1 Amp.	2 Amp.	4 Amp.	6 Amp.	8 Amp.	10 Amp.	0.5 Amp.	1 Amp.	2 Amp.	4 Amp.	6 Amp.	8 Amp.	10 Amp.
25 ft.....	18	18	18	16	16	16	16	18	18	18	18	18	18	18
50 ft	18	18	18	16	16	14	14	18	18	18	18	18	18	16
75 ft	18	18	18	16	14	12	12	18	18	18	18	18	16	14
100 ft	18	18	18	14	12	12	10	18	18	18	18	16	14	14
200 ft	18	18	14	12	10	8	8	18	18	18	14	12	12	10
300 ft	18	16	12	10	8	6	6	18	18	16	12	12	10	8
400 ft	18	14	12	8	6	6	5	18	18	14	12	10	8	8
500 ft.....	16	14	10	8	6	5	4	18	16	14	10	8	8	6
600 ft.....	16	12	10	6	6	4	3	18	16	12	10	8	6	6
800 ft.....	14	12	8	6	4	3	2	18	14	12	8	6	6	5
1000 ft.....	14	10	8	5	3	2	1	16	14	10	8	6	5	4

current supply is provided over the outgoing leased wires, except for large systems.

Telephone Systems

Private telephone systems for plant and office use are:

1 *Two-station system*, used where communication is required between only two stations.

2 *Common-ringing and common-talking system*, suitable where several stations are required but use is infrequent. A prearranged calling code is necessary and only one conversation can be carried on at a time.

3 *Selective-ringing and common-talking system*, permitting one station to call and talk to any other station. But only one conversation can be carried on at a time. Standard systems accommodate 3, 4, 5, 7 and 9 stations. Maximum distance between stations is limited to 2,500 ft. when No. 16 wire is used.

4 *Master-station and common-talking system*, providing for communication from a central point or "master station" to different stations. Selective ringing is obtained and only one conversation can be carried on at a time. Outlying stations can ring only the master station and the call is registered on an annunciator. A similar system is available for selective talking.

5 *Selective-ringing and selective-talking system*, permitting any station to call any other station and the carrying on of several simultaneous conversations. Standard sizes cover 7 to 25 stations. Ringing and talking service requires separate batteries.

6 *Private exchange manual switchboard system*, providing for selective ringing and for many simultaneous conversations. This system is selected when an operator can be on duty while the system is in use.

7 *Private exchange automatic system*, similar in all respects to the system in item 6. The difference is that the manually operated switchboard is replaced by automatic equipment and no operator is required.

8 *The "2-6 and 2-10" system*, permitting selective ringing and common talking with 6 or 10 lines and 2 trunks. It provides local intercommunication and central office service, either manual or dial, from the same telephone without an attending operator. All stations are arranged for secret service on both central office trunks.

Power for the inter-phone systems can be obtained from dry cells or storage batteries. Common-talking systems use the same battery for talking and ringing service. For other systems ringing current may be low voltage a.c. from a bellringing transformer of not less than 50 watts capacity. A rectifier unit may be used in place of a battery.

Maintenance

Because many of the materials and devices comprised in signaling systems are common to one or more functions of signaling, the maintenance requirements may be classified accordingly. The chief considerations are:

1 *Wires and cables*—Adequate capacity of wires is essential. Minimum wire size is No. 18 for open runs, and No. 16 for conduit runs. The runs should be continuous to eliminate joints. Wire sizes for 12- and 24-volt systems are given above.

Voltage drop on lamp circuits should not exceed 10 per cent. For some other devices a drop of not over 25 per cent might be permitted.

Color-coded, rubber covered wires should be used in all signal systems. Color-coded cable should be used whenever more than five wires are required for a run. Braided cable may be used in dry places. Lead-covered cable must be used in damp or wet locations.

2 *Terminals and junctions*—Because of low operating voltages, all terminals must be clean and tight. Whenever connections are made in a run, terminal blocks are an advantage if space permits; otherwise soldered joints should be made and relieved of any strain. Interconnecting strips in cabinets, serving as distributing centers, should be installed at frequent intervals.

3 *Power supply*—Sources of power are dry cells, storage batteries, battery eliminators for d.c. operation, and transformers for a.c. operation. Protection of low-tension circuits for each type of signaling system, should have over-current or protective devices.

4 *Lamp signals* may be used where signal indications can be seen at distances up to 200 ft. If used on coded service and to prevent failure at signal stations, duplicate lamps should be installed and connected in multiple. Signal lamps located throughout the plant should be colored, to distinguish them.

5 *Annunciators* of the drop type occasionally should have armatures and drop pivots inspected, dust and lint removed and terminals tightened. Lamp type annunciators use candelabra incandescent lamps instead of drops. Inspection should be made for amount of light, seating in socket, operation of reset button, and tight connections.

6 *Bells, chimes, gongs* and other audible signaling devices need occasional inspection and cleaning. Armatures and plungers should move freely, contacts be clean and smooth, springs and striking parts adjusted properly, and all terminals tightened.

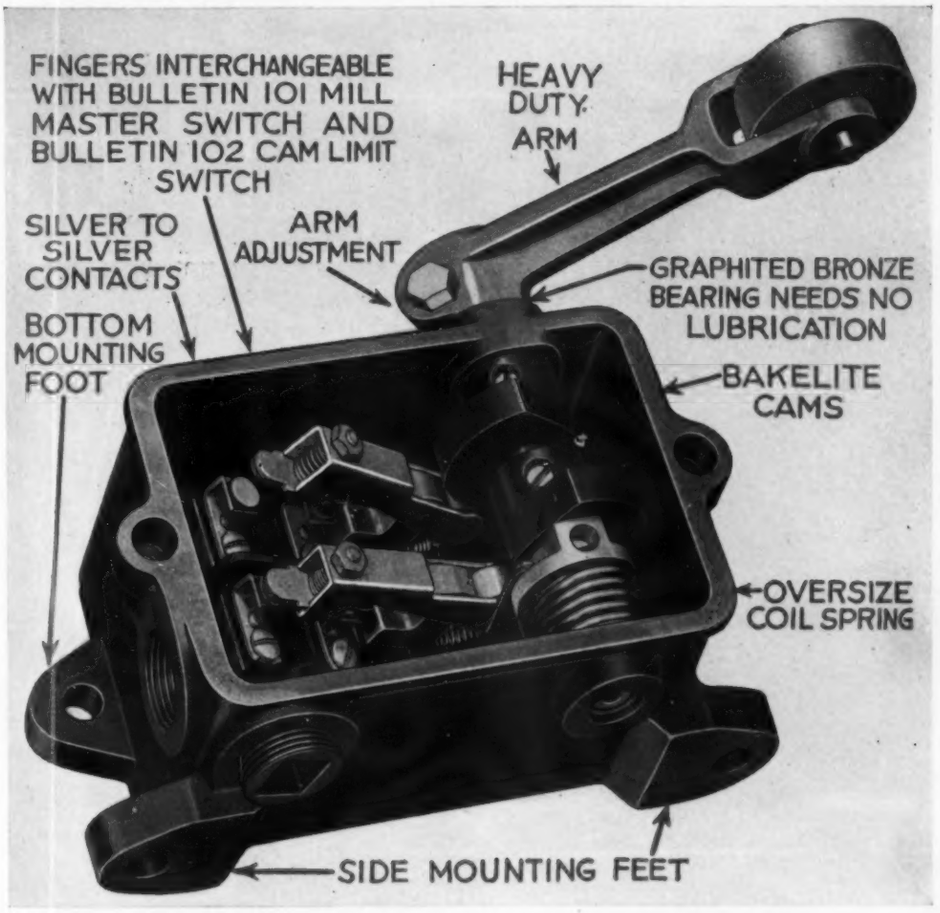
7 *Telephone instruments* are precision made. Coils and connections have very fine wire. Hence caution must be exercised when an inspection is made or servicing is required. Spring adjustment of either the hookswitch or key assembly may be needed occasionally. Diaphragms should have a regular shape and be flat.

8 *Contact making devices* such as push-buttons, keys, plugs and jacks require inspection. Springs need adjustment, terminals tightened, and contact surfaces cleaned.

9 *Power supply*. Fuses, clips and terminals should be clean and tight. Batteries should be checked at regular intervals. Individual dry cells should be removed when their voltage reads one volt or less.

REPORTS ON PRODUCTION *are transmitted from this wall type telephone. Other departments can be dialed directly with private exchange automatic equipment.* (*Automatic Electric Co. photo.*)

Giving you the Works!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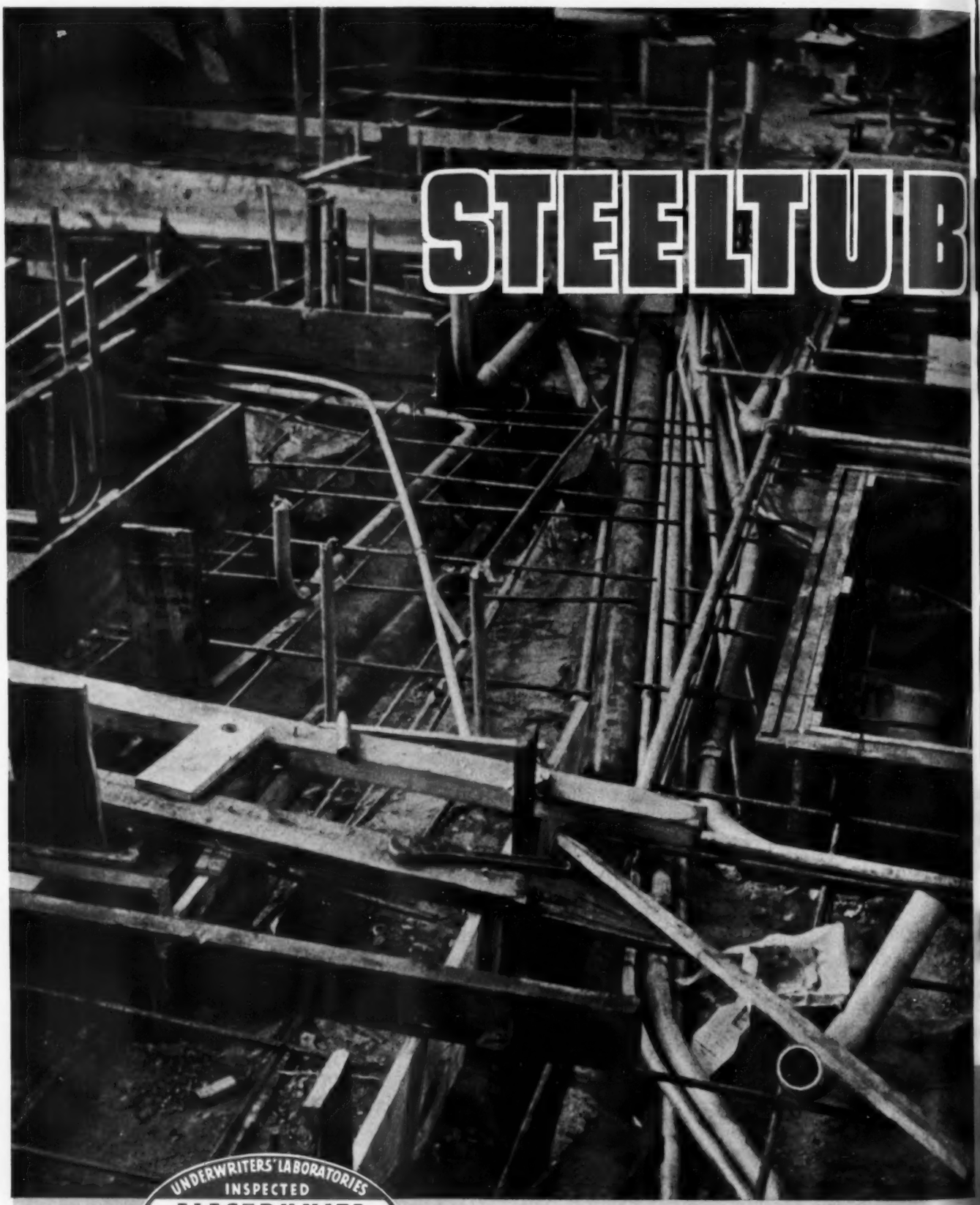

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5. Because there are no threads required in a run of ELECTRUNITE Steeltubes, complete continuity of galvanized surface is assured.
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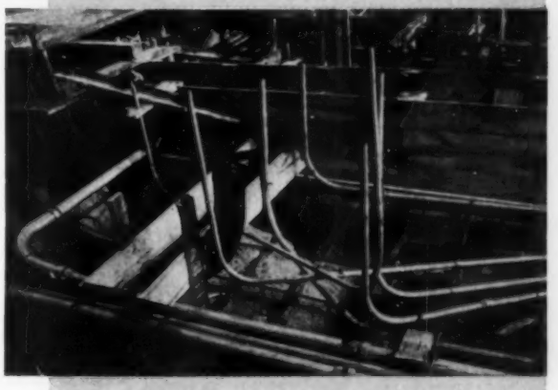

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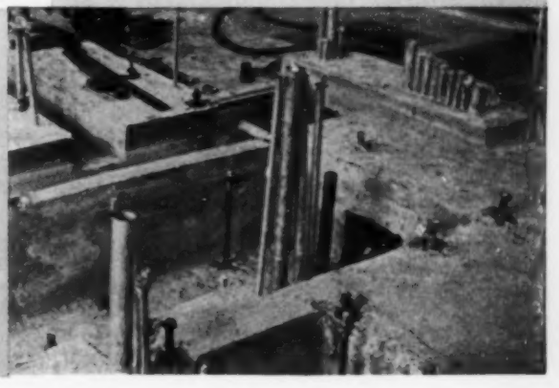
Easy-to-install compression-type couplings make positive, water-tight joints that will not loosen under vibration. Grout cannot seep in at joints.

At left: — ELECTRUNITE Steeltubes is available in a full range of sizes from ⅜-inch to 2-inch. See National Electrical Code for approval.

At right: — Smooth joints and the patented knurled inside finish in ELECTRUNITE Steeltubes materially reduce wiring effort. Bent stubs are easily straightened without damage.



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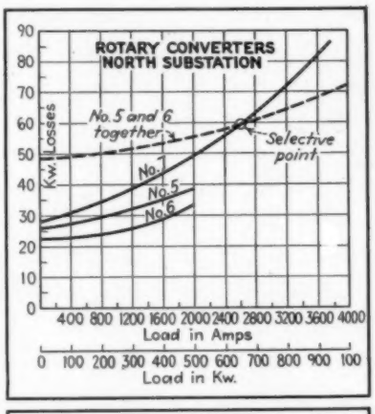
Galva, Illinois

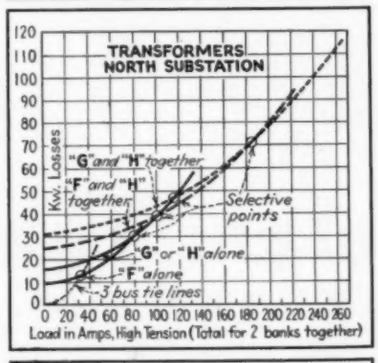
Selective Transformers Reduce Power Costs

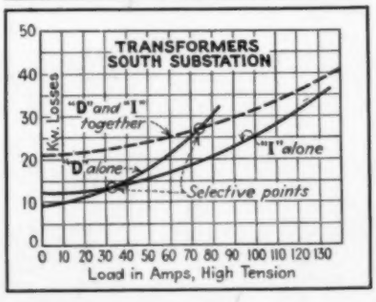
By F. B. Galaher, Supt. of Plant Engineering, Hood Rubber Co.

The plant of the Hood Rubber Company, Inc., Watertown, Mass., has two sub-stations. The North Station has two 3,000-kva. banks and one 1,500 kva. bank of transformers. One of the former is kept as a spare. The South Station has one 3,000-kva. bank and one 1,500-kva. bank of transformers. An attendant is in charge all the time at the North Station, and can tie together the secondary buses of both stations and cut in or cut out the transformers at the South Station.

By a selective operation of these transformer banks, controlled by the attendant, the power bill has been reduced. It has been possible to increase the ratio of the power going into the




TRANSFORMERS
NORTH SUBSTATION
Kw. Losses
"G" and "H" together
"F" and "H" together
Selective points
"G" or "H" alone
"F" alone
3 bus tie lines
0 20 40 60 80 100 120 140 160 180 200 220 240 260
Load in Amps, High Tension (Total for 2 banks together)



***SELECTIVE POINTS** for operation of transformer banks and rotary converters to keep losses at a minimum. Curves are plotted on one sheet but segregated here for convenience.*

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"The Meaning of the RLM *Label"*

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plant from the transformers to the power going into the latter, that is, the operating efficiency, from 93 to 97.5 per cent, due to the reduction in transformer losses. For example: over week ends the secondary buses of the two sub-stations are connected and the smallest bank of transformers which will carry the load is used. All other transformers are disconnected.

The losses for each bank individually, at different loads, and of various combinations in each sub-station, have been plotted on one sheet of cross-section paper. It is possible to tell at a glance when the load is such that the losses will be decreased either by adding another bank as the load increases, or by cutting out a bank as the load decreases.

Before this arrangement was developed, the North Station had only the two 3,000-kva. banks. The company had on hand transformers for the 1,500-kva. bank. When the study was made to reduce the power bill, the latter transformers were installed to provide greater flexibility. Also, they learned that one 3,000-kva. and one 1,500-kva. bank were sufficient for normal operation under full load conditions.

The North Station has three rotary converters for supplying d.c. power for certain machines. Only as many of these are operated as are actually needed so as to keep the losses to a minimum.

Power Factor

This same sub-station has a power factor of 76 per cent because it serves a large number of induction motors. The power factor would be less, if it was not for the synchronous motors driving the air compressors.

At the South Station, the power factor is as high as 94 per cent because the large rubber mills are driven by 500 hp. synchronous motors. These motors take care of the effect of the induction motors in this plant.

On both groups of synchronous motors the field current is adjusted so that the necessary leading reactive current is provided. To this end, the field currents are checked two and three times a day by the electrical maintenance men to see that proper adjustments are made, as the motors heat up and the resistance increases and the current tends to fall off.

In the selective operation of the various transformer banks, a great deal of dependence is placed on electrical instruments. They are maintained in accurate working condition and the operators have been trained to test them. All the power feeders have ammeters which are read every half-hour. Each feeder also has a kw.-hr. meter which is read at the end of each shift to check up on the loads.

Babies Protected Against Chills

Babies' wards in hospitals must have uniform heat at all hours during the day and night. Also, the air must be clean and free from fumes, and the method of heating must be safe.

Electric space heaters can be used as a supplement to the central-plant heating system. The heaters serve as boosters and can be mounted on the walls. When the temperature drops below a predetermined value, thermostatic control turns on the electric heaters, and thus the babies are insured of constant heat.

Mounting Buzzers on Walls

Q. *How many buzzers can be mounted in adjacent rooms so as to avoid confusion of signals by the occupants of the rooms?*—C. D.

A. This has been quite a problem. Buzzers should not be mounted back to back on the same walls, as the sound of one buzzer will be carried from one side of the wall to the other. Where buzzers are mounted flush, this difficulty cannot be entirely overcome.

Adjustment to different tones often helps. If one outlet box is used to serve both buzzers, a piece of wall board may be used in the outlet box to separate the buzzers. It has also been found helpful to place rubber and paper washers on the mounting screws under and above the mounting yokes. However, this merely reduces the vibration. For surface buzzers felt or soft rubber padding may be used with considerable success.

Safeguards For Air Duct Systems

Ducts for ventilating and air conditioning systems have transmitted smoke and spread fire from one small section of a building to another, reports the National Board of Fire Underwriters. Where not properly safeguarded, extensive duct systems can make fire fighting difficult and to result in large fire losses.

One of the best ways to reduce the possibility of having an air conditioning system spread fire, is to divide the system in a large building into several parts. A separate duct system should serve each part or each floor. Automatic fire dampers should be installed in the ducts where the latter pass through fire partitions; also, at each opening in the main vertical duct, which serves several floors, including

Introduced by Yale just a short time ago, the Cable King with its AIR-COOLING feature is already skyrocketing its way to leadership in the electric hoist field. NOW everybody wants AIR-COOLING!

The reason is simple. AIR-COOLING saves the operator money. The basic limiting factor in electric hoist construction has always been excess brake heat. When Yale engineers adapted the special sirocco blower action that would cool the brake frictional parts they, *for the first time,* made it possible to eliminate this heat.

That's the principle of AIR-COOLING—a principle that permits *the Cable King to operate on a heavier duty cycle than any other hoist in the same class.* And that means *greater economy than any other hoist in the same class!*

In addition, the precision construction of the Cable King makes it the closest approach to perfect engineering specifications that has ever been built. AIR-COOLING plus mechanical perfection—that's what you get in the Cable King. It's the very latest advance in hoisting equipment. Contact your local distributor or send direct for free catalogue.

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You've never seen anything like it before... It's the fastest cutting drill ever made!

No More Hammering!

No More Chiseling!

Here's a new drill point you use in rotary electric portable drills and save hours and days of hole-drilling time on your jobs! It's the new Carboloy Masonry Drill—the fastest-cutting, longest-wearing drill ever introduced! Far faster, far easier than the slow, cumbersome, ordinary method of hole drilling. Get *your* share of profits from this amazingly fast drill!

Here's what it does: The Carboloy Masonry Drill drills holes in concrete, brick, tile, slate, etc., 50% to 75% faster! It lasts up to 50 times longer! It holds a keen cutting edge for weeks of continuous use! It drills holes accurate "to the hair." It's the perfect drill for installing expansion anchors quickly and easily. No noisy hammering! No monotonous chiseling! No ragged holes! You merely slip the Carboloy Masonry Drill in the ordinary type of rotary electric portable drill and it's ready to go—and go fast!

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One user reports drilling 4 inches of concrete in 3 minutes. Another drilled holes and installed 350 anchors and pipe straps with 2 men in just 7 hours of work. An airport superintendent says, "It cuts drilling time 95%." A building superintendent says, "It's the best drill investment we ever made," ... And so it goes! Nothing has ever approached the remarkable performance of these Carboloy drills. It costs you nothing to get the complete story about this new, unusual type of drill metal. See your dealer or pin the slug below on your letterhead or postcard and mail today for free folder.

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Masonry Drills

points at which branch ducts are attached to the vertical duct.

An important safeguard is a manually operated fan shut-off, installed at a location which will be readily accessible under fire conditions. A "stop" push button station, identified for its purpose, can be connected to the controller of the fan motor.

Where air conditioning systems recirculate a considerable portion of the air, an additional safeguard is to have the fan shut down automatically in case of fire. A thermostatic device can be placed in the return airduct close to the fan. Such a device will operate whenever the temperature of the air, coming to the fan, becomes excessive. All linings inside of ducts, whether for sound absorption or to cut down heat transmission, should be as nearly non-combustible as possible.

Filters are frequently coated with oil to help catch the dust. It is important that such oil be either non-combustible, or have a high flashpoint. Air filters should be made of material which is fire resistive in itself, or has been made by treatment.

Ducts require attention as well as other equipment of ventilating and air conditioning systems. The maintenance man should arrange for periodic inspection and cleaning. An industrial type vacuum cleaner with suitable attachments will be helpful for the removal of dust from the duct system.

To Provide Heat for Comfort

Electric space heaters are available for heating offices and hard-to-heat places in the shop. They can be used as auxiliary heating equipment in cold weather, and also eliminate the necessity of restarting the main heating plant in the spring and starting it early in the autumn.

Where Are the Lamps Used?

Card records of incandescent lamps as well as motors and other electrical equipment are kept by the electrical maintenance department in one Cleveland plant. The cards for each equipment are filed according to departments.

When a lamp is installed, it is dated thus helping to determine the useful life of the lamp. At the same time, a card record is made, giving size of lamp, date of installation and by whom installed. For specified periods, the cards will indicate how many lamps were replaced in each department.

FOR PROFITS IN WIRING CONTRACTS

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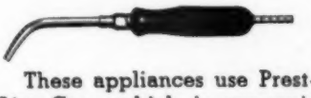
These torches and soldering irons supply proper heat for neat, rapid, economical installation of wire and cable. The torches, for open-flame work, produce instantly a concentrated, exactly controlled flame of high temperature. The soldering irons, for enclosed-flame work, can be kept constantly at a desired heat.



These appliances use Prest-O-Lite Gas—which is convenient, economical, and obtainable at thousands of Prest-O-Lite Gas Exchange Service Stations.

Your jobber will demonstrate Prest-O-Lite Torches and Soldering Irons. Call him—or write the Linde office near you.

The word "Prest-O-Lite" used herein is a registered trade-mark.

THE LINDE AIR PRODUCTS COMPANY
Unit of
Union Carbide and Carbon Corporation
New York and Principal Cities
In Canada
Dominion Oxygen Co., Limited, Toronto

Residential Switches

Just what today's market invites!—a high-grade line priced *in-between* your high- and low-cost switches . . . Now, modest jobs can be *adequately* wired with switches of adequate *quality*.

Switch-bases are small, completely enclosed, substantially made of Bakelite. Solid Bakelite neck and operating lever. Show-parts of brown Bakelite, or cream-tinted white IVORYLITE.

The sturdy mechanism has self-aligning contacts. Wide, reinforced mounting strap adds rigidity. Large binding screws accommodate No. 10 wire. Bases only 1" deep, 1¼" long, ⅞" wide, allow generous wiring room in any switch box.

Listed as standard by Underwriters Laboratories:—rated 10 Amp., 125 V.; 5 Amp., 250 V. No. 1881 is single-pole; No. 1883 3-way. (For IVORYLITE add "I" to catalog numbers above).

SOLD THROUGH YOUR **HART & HEGEMAN DIVISION** ELECTRICAL WHOLESALER

THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

Earl Whitehorne, Editor

Crusaders Wanted on Specifications

Every estimator of smaller construction nurses a burning desire for better electrical layouts and specifications. But like his competitors he is ever eager for more work. So he rushes to figure more jobs and every horrible example of poor planning is puzzled out in spite of ambiguities.

We need a crusade for better electrical plans and specifications Already we have the Industry Handbook of Interior Wiring. We have the A/W program for residential work A promotional plan for commercial establishments is to come. This is a start. Let's go forward—and soon.

It is in commercial and industrial wiring that there are the most variables—therefore the more guesses—the more bidding on loose specifications This should not be. It is about time for contractors, inspectors and others interested in better wiring to have themselves a sound new deal in this direction. Responsible architects and consulting engineers cooperate. And there will be plenty of benefits all around.

Leadership in Code Activities

Local code committees are being set up by IBEW local unions. It is safe to say that the electrical workers from now on will exert a larger influence on the Code than in the past. And this is in reason because these are the men who actually work with the materials and install the equipment.

There was a time in the late twenties when every community had its local industry committee set up to deal with National Electrical Code matters. The depression saw this worthwhile movement fade out but when the 1937 Code appeared, renewed interest manifested itself. It showed promise of a revival of the local Code Committee idea. Certainly it is desirable. And if IBEW members become more active, this should re-awaken the contractors. We need local code committees, and we need the active leadership of contractors in this constructive work.

Unfair to Fixtures

An editorial entitled "Spinach", on this page in December, unwittingly hurt the feelings of the fixture manufacturers. It told of one fixture maker who says that if fixtures had given more attention to illumination and less to ornamentation, the IES lamp would not have proved such serious competition. We thought there was a lesson in it for the contractor, as it applies to disregard of customer comfort in traditional methods of wiring. Intent upon this point, we did scant justice to the progress that has actually been made in fixtures in recent years.

This progress is obvious to the electrical man and to the public. For nothing so marks an antiquated electrical installation today as its fixtures. The evolution in styling and in performance is so striking it dates any house, in which this essential lighting equipment has not been modernized.

It must be remembered, also, that fixtures have a broader function than the IES lamp. They must be decorative as well as give light, and this has always been a difficult combination. These better reading lamps have made a fine contribution; but lighting fixtures still go into every home and will continue to. Meanwhile, fixtures have gone forward with the public taste in design and advanced in the avoidance of glare and the improvement of illumination.

Congratulations, A/W Personnel!

The electrical contracting industry stands under a big obligation to the men who are carrying forward the National Adequate Wiring Program. The 1939 promotion material, just issued, drives home the fact again.

Chairman W. E. Sprackling and the members of the National Adequate Wiring Bureau; Chairman Herbert Metz and the members of the Plan Committee and O. C. Small and his staff at NEMA, who produced these materials, are to be congratulated. They have done a fine job and the industry should be grateful to them. For it is not easy to produce and operate a plan like this. And it is not by accident that this hard-to-tell story is now expressed in the best program of advertising that any cooperative campaign in the electrical industry has yet achieved.

We expect to see a strong response from the country this year and an increasing accomplishment. Of course, it takes time to get a campaign like this rolling, but adequate wiring is now on the march. It deserves the energetic support of every one of us. For isn't it for us?!

Make Way For Customers

In the lobby of a large Toledo industrial plant, we watched the flying fingers of the telephone operator, listened to her almost angelic patience as she handled call after call. Interoffice traffic was the bulk of her work. Frequently outside calls had to wait for a local line to clear. Customers and prospects waited upon office routine.

What a market this offers the electrical contractor! Given even a slight increase in business activity, this board will be overloaded and thousands of others around the country. Some kind of auxiliary intercommunication equipment will be needed. To take the local load off the central telephone switchboard will call for signals, private telephone systems, paging systems, sound intercommunication systems.

It is high time to get about this now. So check up on your customers' communication problems. And the slogan is—"Give the customer a clear line!"

Brighter Prospects

Electrical manufacturers, members of NEMA, submit statistics at the year end on their volume of business and the outlook as it appears to them. Boiled down, they say this time that while general business is expected to increase 10 to 15 per cent this year over 1938, the electrical manufacturing business will gain from 20 to 25 per cent. Last year the NEMA Index went from 75 for the first half year to 85 in the third quarter and 105 in the last.

What it all means is that the electrical manufacturing business is going ahead and fast. And that can be so only as more generating and distribution equipment is sold, more wiring materials and equipment, more current consuming appliances. And it's all good news to the electrical contractor. For if the power companies build more capacity, they sell more appliances that need more outlets. And if there is more building, somebody must do the wiring.

Time Switch Control

When automatic time switch control was something new, we read about it in the Sunday supplements as a marvel of modern science. The general public was interested. But the reaction of the commercial and industrial world was disappointing. Too complicated, they said, another gadget to make trouble, and so on. The fourth assistant to the janitor's helper could come in an hour or so earlier and start up the glue pots or turn on the yard lights.

But today we have "wage and hour" laws, and a universal acceptance of the principle of automatic control wherever possible. People forget and make mistakes. But time switches operate with routine precision. So these are the days to find new places to use time switch controls. And behind that kind of functional analysis in factories waits a vast and varied market for more and more electrical equipment of other kinds.

Samples Sell Factory Improvements

Ideas for plant improvement are hard to sell to hard-boiled factory executives, say some electrical contractors. Perhaps this is often due to the recommending of so many changes at the start that the customer is scared.

One contractor, successful in industrial modernization work, tries a sample to get a start. He picks one small but vital spot in a plant where good lighting, for instance, will show up best—and do the most good. Once such a dark spot is brought up to standard the tables are turned—the boss is on the spot with his own employee family. For when one group of workers gets better working conditions, they broadcast it.

So soon Mr. Contractor has the plant force on his side and the boss wakes up and the door is open to a gradual program of improvement of employee relations. Also, since this contractor gets the business in smaller lumps, it doesn't attract competition. Step by step he can go through that factory, first modernizing the lighting, then control, power factor correction, voltage improvement and the rest.

For Better Specifications

A contractor recently told us how he was asked to bid on an architect's specifications. When he got them, he read—

"Furnish and install all necessary wiring consisting of outlets, switches, base plugs, meter center panels, etc., as may be customary."

Most architects have scant electrical knowledge. So every contractor encounters these vague, incomplete specifications. But—*"as may be customary!"* What does that mean? It's just another pitfall for profits.

In the hope that it will help contractors and architects to write clearer, safer specifications, we will present in our April issue a 48 page Editorial Feature Section on "Electrical Specifications". In a simple step by step manner, it will show how to plan wiring systems and write specifications for residential, commercial and industrial buildings. It will also discuss a point too often overlooked! That is—the use of specifications by the contractor in selling and in protecting his profits.

Copies of this issue will be sent to leading architects throughout the country. We will be glad to see that it reaches the architects of your city—to help you—if you will send us their names.

Back Talk

Rest in Peace!

To the Editor—"Referring to your editorial 'More Plug-in Trouble' in January Electrical Contracting, please let Voltaire rest peacefully. His troubles were other than electrical during life and he probably does not give such a thought now. However, an Italian gentleman by the name of Volta no doubt turns somersaults in his grave, when 2500 watt devices are plugged into ordinary convenience outlets."

C. W. Gustafson, Chief Engineer, Mutual Fire Prevention Bureau, Chicago.

Well, our old friend Gus has certainly pinned this one on us! The editorial reads—"Meanwhile, Voltaire and Aspere turn over in their graves". Of course, we meant Volta, the guy who originally put the Indian sign on the well known volt. His grave has probably been rocking any way. But Voltaire, French philosopher and author, baiter of kings and clergy, general literary hell-raiser of the eighteenth century—he just wouldn't give a damn about our plug-in trouble. Trouble was his chief delight and he enjoyed it in a big way.

Unfair to Fixtures

1. To the Editor—I have just had the discomfort of reading an editorial in your publication entitled "Spinach". It is apparent that the writer has absolutely no idea of the residential lighting business as it exists today. His remarks as to twisted tube and a drooling of imitation wax for candles sounds as though he had not seen a catalog of lighting equipment for ten years.

Such an article certainly does not do any good and we most heartily voice our disapproval of such reading that merely lowers in the minds of those who might read it, the goods or products of the residential lighting fixture industry. We advocate and sponsor, in residential and commercial lines of lighting, engineered illumination for eye preservation along with correct modern styling. Articles should sponsor keeping the center ceiling outlet in the home, not its elimination.

G. E. Glatther, President, The Art Metal Co., Cleveland.

2. To the Editor—Compliments on the message "Now Ask 'Em!" We cut this out and posted it for our salesmen. But the editorial "Spinach" is not true as to the progress that has been made in recent years by the lighting fixture manufacturers.

You are located in the largest city in America, and there are available to you the display rooms of many progressive manufacturers. Any of these would no doubt be pleased to have you inspect their production. I trust you will avail yourself of the opportunity after the Holidays.

A. L. Oppenheimer, President, National Lighting Fixture Guild, New York City.

3. To the Editor—I very much deplore the appearance of the article in December entitled "Spinach". It merely endeavors to give publicity to portable lamps.

This article I understand should be considered as humorous but frankly we do not consider it so. In my opinion it is libelous. There are many lighting fixtures on the market which offer the proper illumination and it is a mistake to describe lighting fixtures as you have done in this article. I would suggest that such articles be omitted from your paper.

J. Markel, President, Markel Electric Products, Inc., Buffalo.

We publish these letters and the editorial "Unfair to Fixtures" on the opposite page, as a frank acknowledgment of our regret that the item "Spinach" in December was harmful to the residence lighting fixture industry. The purpose was not "to give publicity to portable lamps" nor to belittle the progress that has been made in fixture design. The thought expressed by one fixture manufacturer himself appealed to us as good sense with a moral in it, so we passed it along to the contractor.

Motor Shops

FOR DIPPING, MIXING, STORING

A portable varnish tank with a number of distinct advantages has been developed and used by Backstrand Bros. Electric Company, Riverside, Calif. Not only is it portable but it provides a means of mixing thinner, agitating the varnish, and air-proof storage.

The portable rig consists of a 24x30x30-in. steel tank mounted on one end of an angle-iron frame fitted with castors, on the other end of which is mounted a standard steel drum. Connecting the two is a 1½-in. pipe feeding through a gear pump. The gear pump is driven by a ½-hp. 3-phase reversible motor through a gear reduction train. The 60-gal. drum is fitted with a pet cock on its top in order to admit air or to allow it to escape as the varnish is transferred from the tank to the drum or vice versa.

MANY USES—Duplex varnish tank helps in mixing, thinning, and air proof storage as well as dipping.

When varnish is not being used it is pumped back into the drum and thus kept away from the atmosphere. This avoids the formation of scum and waste of the varnish. When varnish is needed in which to dip a rewound motor the varnish is pumped into the dipping tank. The gear pump also acts as a medium for stirring and mixing the varnish. When thinner is needed the action of the pump is an excellent mixing medium.

Size of the dipping tank was determined so that a portable floor crane can straddle it. Thus motors may be lifted in and out of the dipping varnish by the portable crane. Connection is made by means of a heavy duty cord to a double-throw switch, on the rig itself, by which the motor may be reversed.

PRECISION HEADQUARTERS

Instruments are a very definite part of the life blood of Quality Electric Co. Ltd., Los Angeles. Not only does the company use instruments both in sales work in the field, and in testing equipment repaired in its shops, but it maintains also an official and authorized service department for two prominent instrument manufacturers. This company is agent as well for several makes of recording and measuring instruments.

The company's instrument service room is separated by glassed-in partitions from the rest of the shop, both to maintain constant temperature and to exclude dust and noise. Work benches along one side provide the instrument repair and test men with the facilities and tools needed in their delicate tasks. Repaired instruments are compared with standard check equipment on a long work bench at the rear.

MOBILE HIGH-POT TESTS

Instead of moving heavy apparatus to a central testing location, a truck-type high-voltage testing outfit is available for use in any part of the Electrical Installation Company's service shop at Cambridge, Mass. This outfit is shown in use for testing out grounded coils in a 250 hp. rotor. Some of the bad coils have already been marked with chalk.

When jobs come in, an initial insulation resistance or megger test is made with a portable megohmmeter that is available on this truck outfit. For checking grounds between phases of stator windings, 1000 volts is applied, while all new motor windings are given a high-pot test of twice rated voltage plus 1000 volts. Because high test voltages are needed for transformers and special motors, this outfit will deliver up to 6500 volts to the insulated testing electrodes.

MOBILE TESTER—High-pot test outfit rolled to apparatus saves unnecessary handling of shop work.

A 5-kw. transformer, operated from 110-volt portable cord has its secondary taps arranged for a choice of voltages beginning at 500 up to 6500 volts. Jacks arranged on a dead front plugging panel are identified for selecting the desired voltage. A 10-amp single-pole instantaneous-trip air circuit breaker in the 110-volt circuit protects the outfit and tested apparatus against short-circuit damages.

INSTRUMENT SERVICE quarters are separated from motor repair area to protect delicate precision devices from dust

BUCKEYE CONDUIT Softens Up a Tough Specification

Control Board and Youngstown Buckeye Conduit in the new Toledo, Ohio, Vocational High School.
Supv. Architect - Edwin M. Gee, Toledo School Board
Elec. Engineer - Gil Southern, Toledo, Ohio
Gen. Contractor - Henry J. Spieker Co., Toledo, Ohio
Elec. Contractor - Romanoff Electric Co., Toledo, Ohio

ON a job like this, Buckeye Conduit helps you make better time, keeps your cost down to the estimate. Those plate hangers are punched to the size, no extra clearance for a coupling. Spacing is perfect but every length has to be separately inserted one hole at a time, and coupled up in place. A specification like that is a time eater, slows up schedules, costs more money.

Buckeye Conduit will speed up these tough jobs. Its highly uniform ductility makes it easy to throw a radius on a pipe. The threads come clean on the first cut, need no chasing, dies last longer and a coupling made up once is made forever.

Youngstown Buckeye Conduit Steel is made from specially selected ore and is carefully processed to produce a uniform ductility. The flexible lacquer lining is satin-smooth, offers a minimum resistance to fishing, and is tough. Fish wire won't scratch it, and a high non-conductivity factor is maintained with no flaking, no cracking.

Youngstown Buckeye Conduit works with you and for you on every job. Buckeye will help you make faster time, and more profit on your estimates.

BUCKEYE TRADE MARK YOUNGSTOWN CONDUIT

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels

General Offices YOUNGSTOWN, OHIO

Ask your distributor for
Youngstown Conduit - Pipe and Tubular Products - Sheets - Plates
Tin Plate - Bars - Rods - Wire - Nails
Tie Plates and Spikes.

26-7B

Help Promote . . . Better

HOW would you like to get electrical specifications from architects that leave no room for guess work?

Would you be willing to help us make it easier for architects to write such specifications? It will cost you nothing but a few minutes' time.

We know that loosely written specifications frequently encourage bids on minimum wiring by contractors who hope to be "low man" and make their profits on extras. If specifications were completely and clearly written, all contractors would be bidding on *known values*. And there would be fewer headaches and more profits for all concerned.

In June, 1936, ELECTRICAL CONTRACTING published a Master Specifications Issue which was acclaimed by architects and contractors alike. Now, with building again on the march, there is need for a similar job promoting better specifications and greater adequacy.

Our plan is this: in April ELECTRICAL CONTRACTING will carry a 48 page feature section on ELECTRICAL SPECIFICATIONS—*How to Plan and Write Them.* This issue will treat with every phase of specification writing for every class of structure. It will be simply written and help-

Specifications

—and protect your profits

fully illustrated, so that the material will be easy to understand and to use.

We plan to place this issue in the hands of every important architect in the country. And that's where you can help us. Won't you send us the names and addresses of architects for whom you figure? We'll send them a copy of the April issue, with your compliments, at no cost or obligation to you.

Your cooperation will help us promote good specifications, good wiring jobs, and protect your profits.

ELECTRICAL SPECIFICATIONS

A 48 PAGE FEATURE SECTION
in April Electrical Contracting

OUTLINE OF CONTENTS

1. Taking the Gamble Out of Wiring
2. Wiring for Residences, Apartment Houses and Farms
3. Wiring Commercial, Institutional and Factory Buildings
4. Engineering Data — Diagrams — Photographs

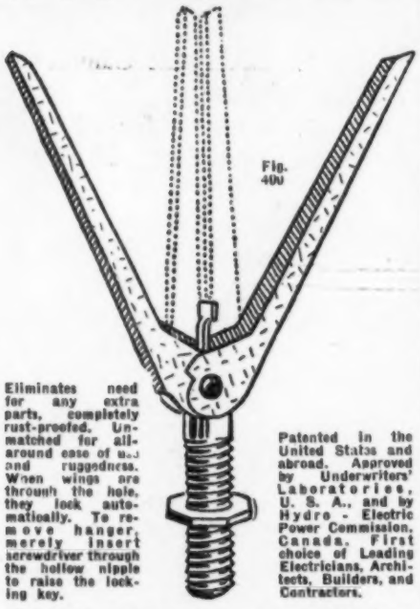
MANUFACTURERS' EXHIBIT SECTION

All advertisers will be indexed by products as well as by company names, making it easy for the specification writer to quickly find what is wanted without further reference.

Send in *your* list of architects to Electrical Contracting *today*

ELECTRICAL CONTRACTING
A McGraw-Hill Publication
330 West 42nd St., N. Y.

THE MOST EFFICIENT HANGER *for* CEILING BOXES *and* FIXTURES *is the* STRONG EASY TO USE PAINE

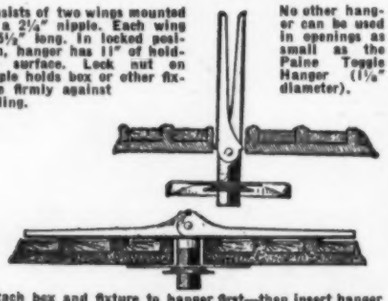


Eliminates need for any extra parts, completely rust-proofed. Unmatched for all-around ease of use and ruggedness. When wings are through the hole, they lock automatically. To remove hanger, merely insert screwdriver through the hollow nipple to raise the locking key.

Patented in the United States and abroad. Approved by Underwriters' Laboratories, U. S. A., and by Hydro - Electric Power Commission, Canada. First choice of Leading Electricians, Architects, Builders, and Contractors.

Consists of two wings mounted on a 2¼" nipple. Each wing is 5½" long. In locked position, hanger has 1¼" of holding surface. Lock nut on nipple holds box or other fixture firmly against ceiling.

No other hanger can be used in openings as small as the Paine Toggle Hanger (1⅛" diameter).



Attach box and fixture to hanger first—then insert hanger wings through opening and tighten lock nuts for a secure job. This saves time and much overhead work.

Ask your Jobber

Get Our Catalog

PAINE

1912 TRADE ANCHORS HANGERS 1939 PARK

Superior Feature

BUILDERS SPECIALTIES

Dept. 592—2949 Carroll Avenue, CHICAGO, Ill.
Eastern Office: 48 Warren Street, NEW YORK, N. Y.

Estimating

[FROM PAGE 64]

pressed each time an item appears on the plans and is checked off with a colored pencil. Tally meter totals are easily reset to zero by means of a small knob, for beginning a count of other items. This device is most commonly

COUNTING AID—Mechanical tallying saves errors for estimators.

employed for counting crowds at public gatherings, and for checking traffic or factory operations.

Estimators who have become accustomed to tally meter counting find less confusion in locating specific outlets and entering those counted. The device also eliminates the need for re-counting if the estimator is interrupted in the midst of a count.

SETTING UP ESTIMATES FOR PARTIAL BILLINGS

After an electrical contract is signed for a government project the electrical contractor is required to furnish a breakdown of his contract with the general contractor. This data is prepared as a basis for requesting payments as work progresses. Similar breakdowns are sometimes required by architects and consulting engineers for contracts on private work.

The Miller Electric Company of Jacksonville, Fla., anticipates this requirement by subdividing all estimates on the pricing sheets to simplify the preparation of the job breakdowns. An example of the final figures as set up for a job look something like this.

Item	*Quantity*	*Unit Price*	*Total*
1 Conduit Work	2740 Ft.	$27.92 c'	$767.80
2 Outlet Boxes	196	1.50 ea.	294.00
3 Panelboard	2	60.00	120.00
4 Wire and Cable	7857	3.50 c	275.00
5 Wiring Devices	105	1.00 ea.	105.00
6 Fixtures	85	4.00 ea.	340.00
7 Service Pole	1	30.00	30.00
			$1,931.80

The total job expense is usually placed on the conduit, as most of this expense is generally incurred during the early part of the job. The object is to have all items equitably distributed to equal the total contract price. If the estimate was not broken down into groups and various items were scattered all through the estimate, several hours would be required to make the breakdown schedule.

JOB COST BREAK DOWN

An interesting breakdown of residence wiring costs was recently made in a paper on the "Economics of Wiring Design" presented at Vancouver, Wash. by L. W. Going, Chief Electrical Inspector of Portland, Ore. Mr. Going chose an actual 50-outlet installation for discussion, and presented actual cost figures secured from the electrical contractor.

The contractor's selling price was $130 for installing 50 lighting, switch and receptacle outlets, electric range and complete service equipment. Armored cable was used except for electrical metallic tubing to basement outlets and range. The service used 1¼-in. rigid conduit, with flush meter cabinet and three meter sockets, as used for off-peak water heating. The total price for this work was distributed as wiring materials 48%, labor 21%, and overhead and profit 31%. Exact costs covering material and labor used for this job were:

Material cost

Service conduit, wire and equipment	$13.96
Rubber covered wire for range and basement lighting circuits	5.67
Armored cable (582 ft.)	20.96
Electrical metallic tubing for range and basement lighting circuits	5.86
Outlet boxes including hangers	8.36
Switches, receptacles and plates	7.68
Total material	$62.49

Labor cost

Roughing in job	$16.00
2 Hours one man and helper	
Finishing	10.94
Total labor	$26.94
Total Labor and Materials	$89.43

One journeyman wireman and helper in 8 hours' time performed the following work—roughed in 50 outlets, including 4 basement outlets in electrical metallic tubing, stubbed service conduit to basement, stubbed range conduit from kitchen outlet box to basement, and stubbed conduit from distribution panel to basement. This time includes the setting of panel board and outlet boxes, and stubbing to basement of the necessary conduits. For finishing, this job included 6 hours' time for one man and a helper, which is slightly under the usual time required for this part of the work.

ADEQUATE WIRING — *means good* SENSE *and* DOLLARS *to* BOTH user and the Industry

The FUSTAT — helps the Industry sell ADEQUATE WIRING

It shows user need for new circuits

Permanent overloading is positively prevented. Once the correct size Fustat has been installed it cannot be replaced with a larger size and tampering it in any way is virtually impossible. If additional circuits are needed the user cannot side-step the issue at the sacrifice of safety.

It reduces low voltage complaints

The user cannot load the circuit beyond the proper capacity of the copper. This prevents a voltage drop that is so frequently the cause of complaints about toasters, percolators and other appliances not operating efficiently.

It permits more outlets per circuit

Adding a maximum number of outlets is a perfectly safe practice because the Fustat guards the circuit against overloading.

It guards against blowing of main fuses

The branch circuit Fustat will almost invariably open on a short-circuit or overload, AHEAD of the main fuse or Fustat — because it cannot be replaced by an oversize fuse or readily tampered. When it does open to protect, only the *normal load* of one circuit is off the line instead of a user possibly having all of his lights and appliances out of service because the main fuse blew.

It permits adding more appliances to present circuits

A circuit can be loaded to approved capacity without needless blows and without sacrifice of safety. The long time-lag of the Fustat keeps it from blowing on motor starting currents or other harmless overloads.

It builds user confidence in doing things electrically

The Fustat helps sell the electrical way of doing things — for it generally permits users to add new appliances without being annoyed by needless blows . . . it assures proper operation of appliances because low-voltage cannot be caused by overloading . . . it reduces chances of users being frightened by shorted cords burning up, for the quick action of the Fustat on dangerous cord shorts—prevents spraying of metal, starting of fires, burning of users . . . it helps teach user that the protective device is a desirable safeguard instead of a nuisance . . . **thus it assists the whole industry to build towards bigger business and better times.**

It's just good business to sell, install and use Fustats

WHAT IS THE FUSTAT?

It is a fuse to which a thermal cutout is added.

It protects like a fuse against short-circuits — even high resistance shorts such as occur in flexible cords.

It protects against permanent overloads, even when as light as 25%.

Yet it will not blow on motor starting currents of washing machines or other appliances.

It has a base that guards against anyone robbing the circuit of protection.

Retails at 7½c

It fits Edison base fuseholders through the use of an inexpensive adapter.

The FUSTAT

Retails at 7½¢ in 15 to 30 amp. sizes

For Full information write to any of these firms

BUSSMANN MFG. CO., University at Jefferson, St. Louis, Mo.
JEFFERSON ELECTRIC COMPANY, Bellwood, Ill.
KIRKMAN ENGINEERING CORP., 121 Sixth Ave., New York City
NATIONAL ELECTRIC PRODUCTS CORP., Fulton Bldg., Pittsburgh, Pa.
UNION INSULATING CO., 27 Park Place, New York City

Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

Farm Wiring

Q. *"The inspector demands that service entrances on barns be put on the outside of the building and brought in through a capped elbow to the fuse box. This is impossible with some barns which have sheds built around the main barn. Furthermore, dampness enters conduit in the winter, will collect in the capped elbow drain holes and will freeze shut. The wires will be immersed in this moisture. Conduit could in some cases be run up on the inside of the barn and bent out at a point sufficiently high above the ground. REA specifications from Washington demand this, but the inspector is opposed to it. What does the code say?"*—T. L. E.

A. It depends on whether the main service enters the barn and requires service and meter equipment at this point, or whether the line to the barn is but a feeder. If the first condition is encountered, the shed presents a problem, especially if it is an enclosed shed. If the shed through which the service must run is enclosed, the service entrance equipment should be located in the shed. Section 2351a requires that service equipment be located at a readily accessible point nearest to the entrance of the service conductors. If the shed is an open one, then the service could run down through the shed roof and enter the barn at the point nearest to where the service equipment is to be located. The "capped elbow" used on the service conduit according to Section 2338, must be a type approved for raintight service. This should prevent dampness entering the conduit. But entering the barn some distance above the service equipment is not desirable, although no one would probably make objection to a drop of three feet or so.

The other condition is where the service equipment is not located in the barn, and the line to the barn is but a feeder from some other distribution and metering point. In this case, inasmuch as the line to the barn is protected by fuses at the distribution point, it may enter the barn at any point and run down inside the barn to any desirable point. Also a service switch in the barn is not required, provided a switch is placed somewhere back on the line—say at the distribution point.

Vault for Transformer

Q. *"I desire information as to whether an installation comprising three oil-filled transformers of a total capacity of 75 kva. and operating on a primary voltage of 4,150, must be installed in a vault constructed in conformity with sections 4521-4527, inclusive? Or is it permissible under section 4504, paragraph c to set these transformers in a fire resistive building surrounded by a curb 6" high with proper ventilation so arranged that they are protected mechanically and inaccessible to unauthorized persons?"*—F. E.

A. Section 4504 of the code covering transformers of over 600 volts filled with combustible oil, in paragraph c, has the same requirement as those for less than 600 volts which, in rule 4503-c-2, would permit three transformers of a total capacity of 75 kva. to be installed without a vault. This is providing they were in a room of fire resistive construction and surrounded by a concrete curb of not less than six inches from a basin of sufficient capacity to retain all of the oil.

STATE INSPECTOR *C. A. Peebles of Wayne county, Michigan is a genial gentleman whose staff of inspectors is fast "going Hollywood" from acting in front of his movie camera. The films of inspector methods he takes are shown to electrical groups and civic bodies around the state.*

Bonding Service Cable

Q. *Does Section 2552, Paragraph A, Page 63, of the Code refer to Service Entrance Cable, either A.S.E. or S.E.?"*—H. L. G.

A. Although there has been considerable confusion over this rule and many think that the extra bonding devices are not required with service cables, the rule itself in 2552a is very definite. It requires that "bonding jumpers, clamps, or other devices (not locknuts and bushings) approved for the purpose, be used for bonding *service cable armor or sheath"* to "(b) all service equipment enclosures and/or" (c) any conduit, pipe or armor which forms part of the grounding conductor to the service raceway."

This, therefore, includes both S.E. and A.S.E. cables. It would not apply to U.S.E. cable unless the U.S.E. cable was used overhead as Section 2552 refers to overhead services only.

Tap to Overcurrent Device

Q. *"Rule 4349 states that—*

(1) If conductors between the tap and overcurrent device has the same capacity as the feeder, or,

(2) If they have a capacity of ⅓ of feeder and are not over 25 feet long, the fuses at the taps may be placed where accessible.

Why do they just mention the wires from tap to overcurrent device? How about those from overcurrent device to motor?"—F. R. B.

A. The conductors from the overcurrent devises to the motors would always be considered protected by the overcurrent devices, even where they might be smaller than the taps from

Because it is so completely satisfactory . . . a wire which a contractor is glad to have specified . . . or to specify as his own preference.

GUARDIAN*

BUILDING WIRE

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GENERAL CABLE CORPORATION

Sales Offices: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • LOS ANGELES NEW YORK • PHILADELPHIA • PITTSBURGH • ROME (N.Y.) • ST. LOUIS • SAN FRANCISCO • SEATTLE • WASHINGTON (D.C.)

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DRAMATICALLY VISUALIZES . . .

- HOW **ART METAL** LIGHTING CREATIONS PROVIDE LIGHT CONDITIONING
- WHAT TODAY'S LIGHTING FASHIONS ARE FOR EVERY ROOM IN THE HOUSE

. . . AND WILL HELP YOU ANSWER SUCH QUESTIONS AS THESE!

- What are the functions of total indirect lighting?
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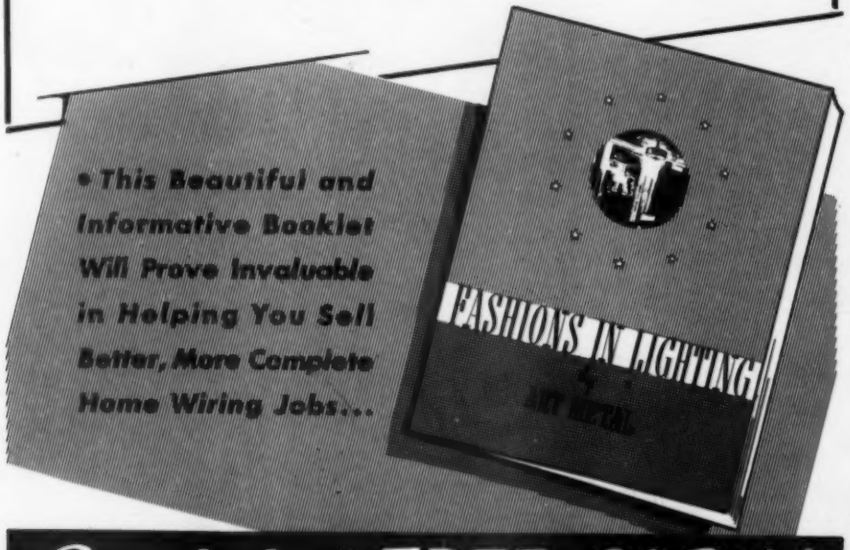
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Please send me, at no cost, a copy of your new edition of *"Fashions in Lighting"*.

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Questions on the Code

[FROM PAGE 70]

the feeders to the overcurrent devices. For example, we might have a case where a 10 amp. motor was to be connected to a main feeder of No. 0 wire. The motor would require only No. 14 wire but the tap, to take advantage of 4349, would have to be at least No. 6 wire. But then after reaching the overcurrent device the wires to the motor could be No. 14.

Oil Burners Protection

Q. *"In reviewing 'Questions on the Code' in the August 1938 issue of 'Electrical Contracting' we note Question 1 relating to motor overload protection of oil burners. The answer states that the Underwriters' Laboratories have not as yet listed any oil burners as meeting the classification of 4322c-3. As you will recall, this rule was the subject of some correspondence between us last June. We assume, no doubt, that the present article was written before you received the information mentioned in our previous correspondence.*

Rule 4322c-3 in part reads: 'Approved assembly . . . which is equipped with . . . safety combustion controls . . . which protect the motor against damage due to stalled rotor current.'

We note that the questioner apparently overlooked a very essential part of this rule, that is, the last eleven words, and upon referring to the February 1938 issue of 'Electrical Contracting', we find your explanation of the rule there also makes no mention of this part of the requirement. We are bringing this to your attention at this time as we feel you may wish to enter a further explanation in a future issue of the magazine."—General Electric Co.

A. We are very glad to have the above comment and the opportunity of bringing the information on this subject up to date. The answer appearing in the August issue and referred to above, was written during February but did not reach our pages until the August issue. We regret that in the interim we did not bring the report up to date.

The Underwriters' Laboratories, June 1938 "Supplement to December 1937 List of Inspected Gas, Oil and Miscellaneous Appliances" now shows on page 11, under "Oil Burners-Domestic" several types of G.E. burners with the following, "Safety control-combustion (integral G.E. control with combustion thermostat) *also provides motor protection.*"

VARNISHED CAMBRIC • RUBBER COVERED POWER CABLES • BUILDING WIRE

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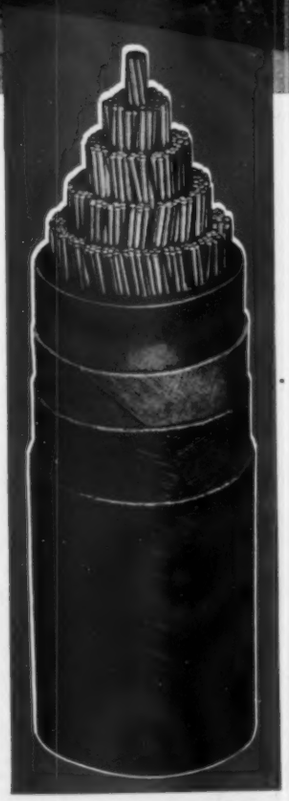
INSULATED WIRE and CABLE

BARE WIRE • SIGNAL CABLE • MAGNET WIRE • LEAD-ENCASED AND PARKWAY CABLES • ARMORED CABLE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • FLEXIBLE CORDS • RADIO WIRES



To carry the load imposed by heavy industry, CRESCENT offers a complete line of which a few are Control Cables, Rubber Covered Power Cables, Lead Covered Cables, and Varnished Cambric Cables. Where excessive heat, vibration and hard usage are encountered, specify CRESCENT super-aging and heat-resistant ENDURITE Insulation. Write for complete information or call on your nearest Crescent representative.

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CRESCENT ENDURITE SUPER-AGING INSULATION • WEATHER-PROOF WIRE

In the News

GENERALS TO NAME THEIR SUBS

In cooperation with other national organizations of subcontractors, NECA has prepared a new bill to be acted upon in the present Congress. It is similar in general purpose to "H.R. 146" passed by Congress at its last session but vetoed by the President. This required general contractors on public building projects to name in their bids their subcontractors, material men and supply men whose services the bidder intends to utilize in the performance of the work.

The new draft of this bill has eliminated all of the objectionable features of the former bill which were the basis for the President's veto. It covers only the fundamental purpose of the bill—to prevent bid shopping by general contractors after they have secured their award of the contract based upon bids of subcontractors and material men. In his veto memorandum the President stated that he recognized the evils of bid shopping and favored practical measures to eliminate it, but was forced to veto the bill as passed by Congress because it injected other provisions for other purposes which were impracticable of enforcement.

The new bill has been submitted through Senator David I. Walsh of Massachusetts for introduction in the Senate.

NECA EXECUTIVE COMMITTEE MEETS

The mid-winter meeting of the National Executive Committee of NECA will be held at the headquarters office of the Association in New York City on February 6th to 8th. Following the three days of the executive committee meeting there will be a two days' session of the Labor Relations Committee.

SPOKANE THE 20th A/W CITY

Spokane, Wash., recently became the twentieth city where the local A/W group has undertaken certification. The territory to be covered includes the city of Spokane and all or parts of nineteen counties in Washington and Idaho. H. C. Bender, of the Washington Water Power Co., is secretary of the Spokane Adequate Wiring Bureau.

Among other recent A/W activities—

Thousands are visiting an exhibit house in Philadelphia known as "Philadelphians at Home" and are impressed with the high degree of electrical comfort, convenience and efficiency made possible through its adequate wiring system. This centrally located home has been certified.

The Adequate Wiring Bureau of the Akron, Ohio District recently announced its first adequate wiring certificate. Mayor Lee D. Schroy presented the certificate to the owners of the adequately wired home which launched the local certification and publicity program. An industry dinner attended by more than 100 followed this event. Four homes have since been certified and a number of others are being built to the adequate wiring specification.

NEW YORK'S MODEL LEGISLATION RELEASED

Two printed booklets comprising suggested legislation for cities and counties in New York State to set up licensing and inspection were recently released by the New York State Association of Electrical Contractors and Dealers. These model forms are being distributed to contractor groups throughout the state to assist them in obtaining favorable local ordinances in cities, and resolutions in the counties of the state. Comprising 24 pages, these booklets represent two years of combined effort on the part of the state's interested industry groups to suggest legislation satisfactory to all.

Enabling legislation was passed by the New York Legislature in 1937 which permits the adoption of local regulations like those recommended. Provisions are made for examining and licensing master and special electricians, for an administrative board, and for procedure in issuing permits and making electrical inspections.

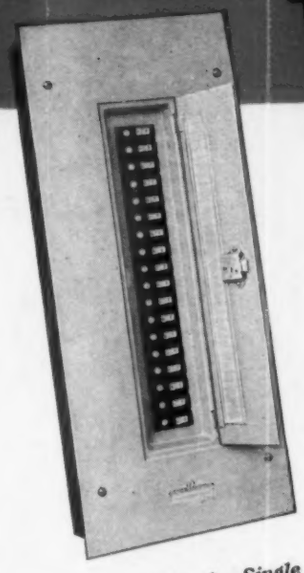
NEMA FORECASTS IMPROVEMENT FOR 1939

Improvement of 20 to 25 per cent in the electrical manufacturing industry for 1939 over 1938, is forecast by statistical experts of the National Electrical Manufacturers Association. An expectant rise in general business activity of 10 to 15 per cent, and an advance by as much as 15 to 18 per cent in the durable goods industry is anticipated.

Among the factors indicating a better

"The boss still thinks that woodpecker is us workin'. Let's play another hand Pete! Good ole Woodpecker!"

EST. 1891
THE SIGN OF A FA BETTER JOB
Frank Adam
AC PANELBOARDS
FRANK ADAM ELECTRIC CO.
ST. LOUIS, MO. U.S.A.



FA Panelboard—Single row AC Circuit Breaker with AC Circuit Breakers for all branch circuits.

NEW FA AC PANELBOARDS

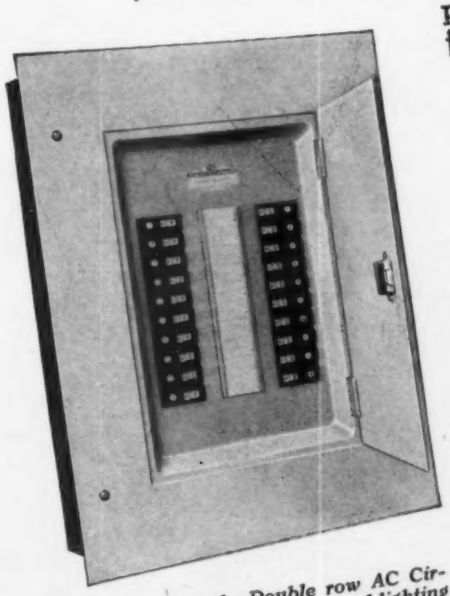
AUTOMATICALLY RESET WHEN ELECTRICALLY TRIPPED—ONLY TURN THE HANDLE TO THE "ON" POSITION

The New FA AC Panelboards illustrated on this page offer another profitable reason why you should standardize on FA construction no matter what your Panelboard requirements may be — whether for homes or small commercial and industrial applications.

In addition to the 50-year reputation for quality products these new FA Panelboards offer you the following desirable advantages:

1. Protection of lighting and appliance branch circuits against sustained overloads or short circuits — when protection is needed!
2. Unnecessary and annoying service interruptions are definitely avoided because of the properly engineered time lag features of the breaker thermal element.
3. Approved by Underwriters' Laboratories.
4. Deliveries made when material is required on the job.

Get in touch with your Frank Adam Distributor or Sales Engineer — he will gladly give you the benefit of years of experience in all types of standard and specialized Panelboard installations.



FA Panelboard—Double row AC Circuit Breaker—2 row standard lighting Panelboard with AC Circuit Breakers for all branch circuits.

Frank Adam
ELECTRIC COMPANY
ST. LOUIS

FA TRADE MARK PRODUCTS.. "The Sign of a Better Job"

[FROM PAGE 74]

1939 are the prospects of larger building operations and the fact that many plants are in a better position to modernize and add electrical equipment. Greatly improved inventories are shown. Major appliance stocks for example, having been reduced to one-third of what they were at this time last year. Replacement sales are increasing due to the obsolescence of older appliances and increased efficiency of new models.

NISA CHAPTER SETS STANDARDS

Formal organization of the new Central District Chapter of the National Industrial Service Association was announced with the election of officers for 1939 at a meeting in Chicago on January 10.

Roy Hyre, Hyre Electric Company, Chicago, for many years a leader in motor shop activities in the Chicago area, is the first president of the new organization. Joe Ferrari, Excel Electric Service Co., Chicago is vice-president, Phillip Guion, Secretary and Harry Roberts, Treasurer. Herbert Binner was selected by the organization as Executive Secretary. The executive committee is C. A. Sievert, Charles Kaska, Samuel Hohman, Arthur Wagner and J. E. Thompson.

"To foster the interests of the motor shop industry," the Chapter demands first of all that the members be competent representatives of the industry. They have therefore set up minimum standards of shop equipment as a qualification of membership in the organization. It must include:

1—screw cutting engine lathe
1—drill press
1—coil winding machine
1—coil taping machine
1—5 gal. (or more) capacity dipping tank
1—bake oven
1—set of portable ac and dc volt and ammeters.

COOK COUNTY CONTRACTORS MARK FIRST YEAR

Electrical contractors in the Chicago metropolitan district, who are members of the Cook County Electrical Contractors Association, met on January 9 to celebrate the first birthday of the organization and to install officers for 1939.

William J. Templeman, Premier Electrical Construction Co., Chicago, was elected president to succeed Elton A. Gould, Gould Electric Co., Chicago, who led the organization during its first year. Max G. Jahns was elected vice-president. Recording Secretary A. L. Simons and Treasurer E. J. Ermel were re-elected to their present posts.

Three new directors, Henry Bell, Emil DeHaan and Joseph Kunst, and four incumbents, J. M. Braverman, Frank M. Block, Alvin Oppenheimer and John J. Sahula were elected to the Board of Directors.

COOK CO. CAKE—*New President William Templeman cutting into a huge "prosperity" cake at the first year celebration.*

"There, that ought to hold them up, Mr. Brown—we haven't fallen down on a wiring job yet."

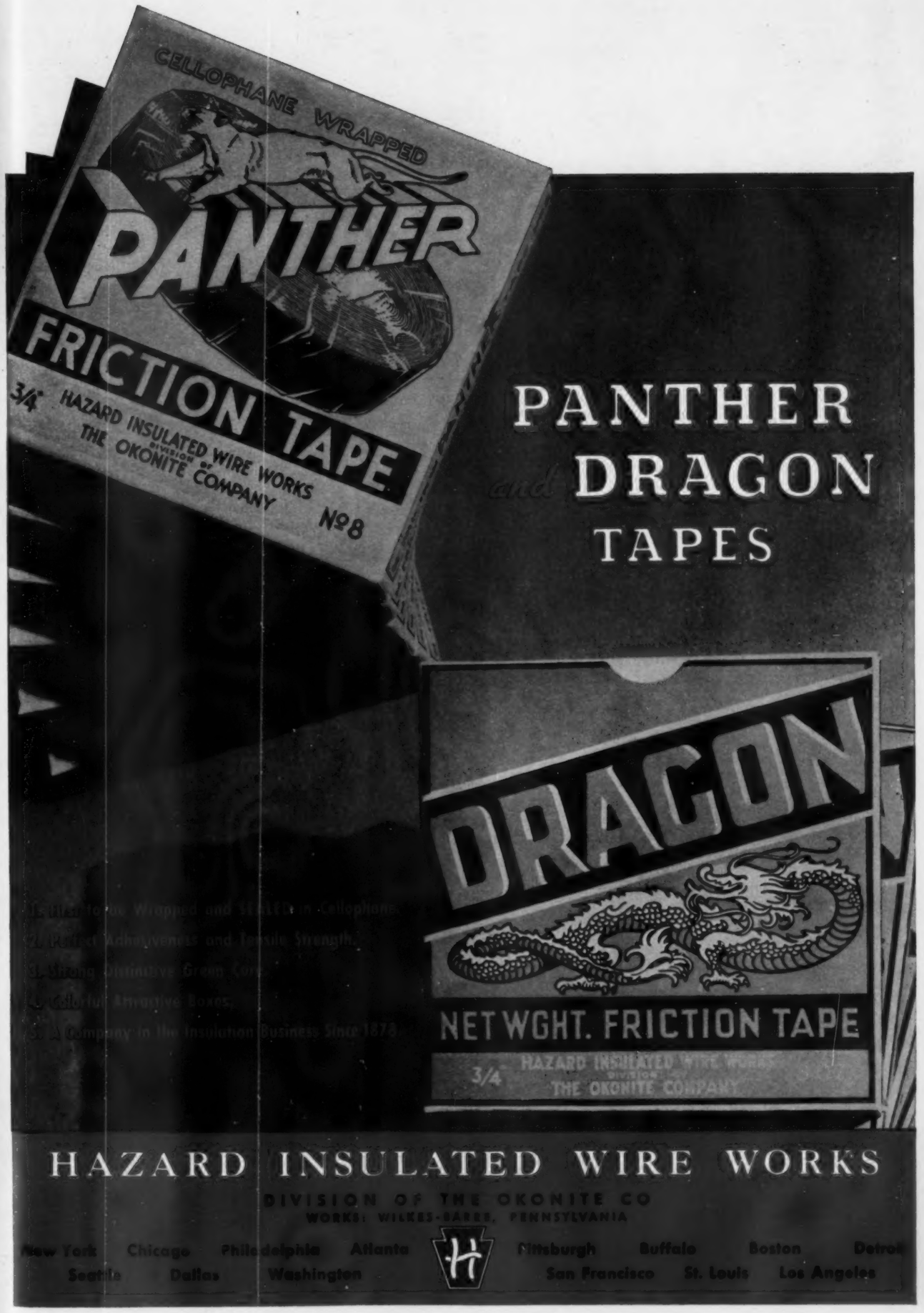
BUSH AGAIN HEADS NEW YORK ASSOCIATION

A. Lincoln Bush, president of Belmont Electric Company, Inc. has been re-elected president of the Electrical and Gas Association of New York, Inc. on January 18th.

Other officers elected were vice presidents E. F. Jeffe, Consolidated Edison Company; J. H. McKenna, A. J. Lindemann & Hoverson Company; Hugh Cuthrell, Brooklyn Union Gas Company; and David S. Youngholm, Westinghouse Electric and Manufacturing Company. P. Schuyler Van Bloem, Viking Lights, Inc., is treasurer. S. J. O'Brien, S. J. O'Brien Sales Corporation, is secretary. H. C. Calahan, General Electric Supply Corporation, is assistant secretary.

HOLD MEETING ON WIRE RATINGS

Recent Research by a NEMA technical committee to find out how much current can be safely carried by rubber covered wires has aroused considerable interest. In Springfield, Mass., a meeting was held on January 12, sponsored by the United Electric Light Company, at which the 15-page research report was explained in detail. About 750 notices were distributed to announce this meeting and its purpose. L. L. Carter, assistant chief engineer of Anaconda Wire and Cable Company, presented the NEMA report, "Maximum Permissible Current Carrying Capacity of Code Insulated Wires & Cables."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Safeguard your Service *and* Profits *with* DIAL-O-PHONE

Connecticut Dial - O - Phone, with its smart dial and simple mechanism, is a notable advance over older and less flexible systems.

It provides for selective ringing and talking without central switchboard. Several conversations can be carried on without interference.

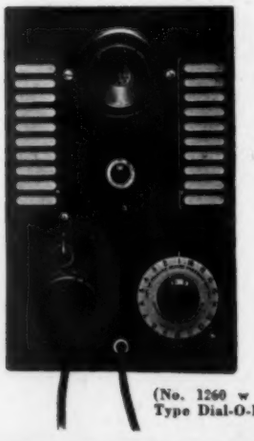
Capacities of 8, 12, 18, or 24 lines are available, and code calling features may easily be added.

These superior instruments are furnished in cradle, surface wall, and flush types, with hand phones or watch case receivers available for surface and flush type sets. For power supply, regular service lines with rectifier, or batteries may be used.

Write for complete details of Dial-O-Phone and other modern Connecticut Systems.

(No. 1200 w Cradle Type Dial-O-Phone)

(No. 1250 w Surface Type Dial-O-Phone)



(No. 1260 w Flush Type Dial-O-Phone)

CONNECTICUT TELEPHONE & ELECTRIC CORPORATION

Established 1894

Division of Air Devices Corporation

MERIDEN . . . . . CONNECTICUT

In the News

[FROM PAGE 76]

DELMARVA CONTRACTORS MEET

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Florida Association of Electrical Contractors —Orlando, March 5–7.

National Industrial Service Association—Convention, Jefferson Hotel, St. Louis, Mo., April 17–19.

MORE REA WIRING LOANS

The Rural Electrification Administration recently announced allotments totaling $3,447,000, which includes these items for financing house wiring and plumbing installations:

Kentucky—$20,000 for customers in 15 counties
Missouri—$5,000 for customers in 8 counties
North Carolina—$13,500 for customers in 4 counties
Virginia—$15,000 in 5 counties
Georgia—$35,000 for customers in 13 counties
Indiana—$5,000 for customers in 4 counties
Louisiana—$5,000 for customers in 3 parishes
Michigan—$25,000 in 6 counties
Mississippi—$16,000 in 5 counties
Texas—$8,000 for customers in 2 counties
Wisconsin—$10,000 for customers in 1 county

One of the Adequate Wiring Bureau Cuts

You Should be on

SPEAKING TERMS

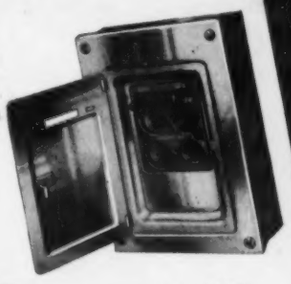
with every one of these COLT SERVICE Equipment Devices

. . . they mean Cash in the Till to You

No. 35N6-F Flush Type Cabinet with Provision for Transformer and Despard Switches

FUSELESS MAIN SWITCHES . . . with Branch Circuits

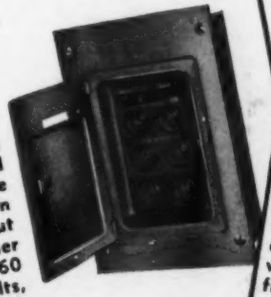
Equipped with as many as six branch circuits, as now permitted by the National Electrical Code. Front operated Rotor Disc type switches, 30 Ampere, 125-250 Volts, with Solid Neutral. Cabinets supplied for Surface or Flush Mounting with or without provision for both bell ringing Transformer and Despard type switches. Plaster adjustments for flush type cabinets. Dome covers permit use of non-tamperable fuses. Interiors are quickly removed from cabinets for wiring . . . the mechanism is designed for long wear and maximum safety.



No. 32N3

FUSIBLE MAIN SWITCHES . . . with Branch Circuits

Front Operated
30 Amp. Rotor Disc Type
Flush or Surface Cabinets



No. 29L4-F

These devices are similar in design to the Fuseless Main Switches described above. They provide in one complete unit, a main switch and both main and branch fuses, with or without provision for bell ringing Transformer and Despard type switches. 30, 60 and 100 amperes, 125-250 Volts, with Solid Neutral. Surface or flush cabinets. Plaster adjustments for flush type cabinets. Interior units are easily removed . . . covers designed for use of non-tamperable fuses. Ruggedly constructed, with simple, safe mechanism.

PULL OUT SERVICE SWITCHES . . .

with Branch Circuits
3 Pole, 125-250 Volts, Solid Neutral

No. 7RL4

In this complete line of Service Switches, the 60 Ampere cartridge fuses are located in removable fuse holders. The circuit is opened by simply withdrawing the holder from the block. The entire switch mechanism is removable and the block can be reversed to bring lighting circuits at the top. Fuse Holders and Plug Fuse Receptacles are accessible through an auxiliary door in the cover . . . and full clearance is allowed for non-tamperable fuses.

COLT *Electrical Products . . .*

Manufactured by a World Famous Organization

COLT'S PATENT FIRE ARMS MFG. CO., Hartford, Conn.

COLT NOARK Electrical Division

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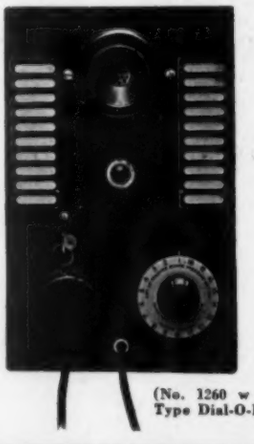

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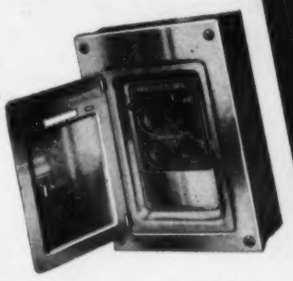

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3 Pole, 125-250 Volts, Solid Neutral

No. 7RL4

In this complete line of Service Switches, the 60 Ampere cartridge fuses are located in removable fuse holders. The circuit is opened by simply withdrawing the holder from the block. The entire switch mechanism is removable and the block can be reversed to bring lighting circuits at the top. Fuse Holders and Plug Fuse Receptacles are accessible through an auxiliary door in the cover . . . and full clearance is allowed for non-tamperable fuses.

COLT *Electrical Products . . .*

Manufactured by a World Famous Organization

COLT'S PATENT FIRE ARMS MFG. CO., Hartford, Conn.

COLT NOARK Electrical Division

MODERN

Built to meet to-day's requirements . . .

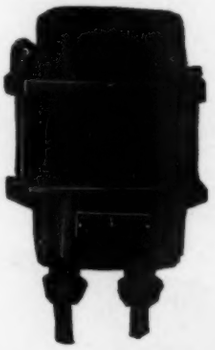
Type CFT, three-phase, outdoor type air-cooled transformer.

CONSIDER the economy and convenience of AmerTran Type "CF" Air-Cooled Transformers whenever it is desired to obtain low-voltage power from higher voltage circuits. These moderately priced units are available in sizes up to 100 Kva. and for potentials up to 600 volts. They may be installed wherever they are needed—either indoors or outdoors*—without the necessity of oil, fireproof vaults or enclosures. They are also equipped with either conduit fittings or a built-in junction box to facilitate installation, and both single-phase and polyphase types are furnished as a single unit. These features mean low first cost and minimum installation and maintenance expense. May we send data on equipment to meet your needs?

* Units 15 Kva. and larger for indoor service only.

Type "CF" Applications

1. Stepping down power circuit voltage to 115/230 volts for lights, small motors or heating elements. In this way advantage may be taken of lower power rates for low-voltage loads.
2. Obtaining a 3-wire circuit from a 2-wire system.
3. Changing from 3 phase to 2 phase, or vice versa, on a power system.
4. Obtaining low voltage for heating welding, 32-volt tools, special lighting, testing, etc.
5. Balancing load on 3-phase systems.
6. Insulating one circuit from another.
7. Distributing power at 600 volts or less.
8. Reducing light flicker.
9. Obtaining special voltages to permit efficient operation of equipment.



Type CF, single-phase indoor type, air-cooled transformer.

AMERICAN TRANSFORMER COMPANY

178 Emmet St., Newark, N. J.

AMERTRAN TRANSFORMERS

Manufactured Since 1901 at Newark, N. J.

In the News

[FROM PAGE 78]

ALBANY OFFICERS

The Albany (N. Y.) Electrical Contractors Association, Inc., elected these officers for 1939: E. G. May, president; Felix Henzel, vice-president; A. Schroeder, treasurer and Edward Murphy, executive secretary.

NEW KANSAS CITY OFFICERS

The Kansas City Chapter, NECA, recently elected these officers for 1939: W. T. McAuley, president; Louis G. Schumacher, vice-president; Fred Geiss, secretary; and Ed Fickie, treasurer. Directors are E. H. Clark, G. V. Dameron, B. R. Nelson and W. M. Wachter.

JOHN HOWARD DRAKE DIES

John H. Drake, director of the Regulatory Legislation Department of the National Electrical Manufacturers Association, New York, died December 26, 1938 at Schenectady, N. Y. He was 58. He had been a member of the NEMA staff since 1933, and is well known to electrical contractors throughout the country.

Born in Morris Run, Pa., Mr. Drake was graduated from Stevens Institute, Hoboken, N. J., as an electrical engineer. After four years with the General Electric Company at Schenectady, N. Y., he held various executive positions with lighting utilities and engineering organizations.

BOOK REVIEWS

Data on Small Motors

"Fractional Horsepower Electric Motors"—a new book that tells what kinds of small motors are available, what makes them run and what they will do, how to repair, rewind and reconnect them, by Cyril G. Veinott. Eighteen major types of small motors are covered in a systematic presentation of descriptions, data and diagrams. The book is arranged for practical use by the service, repair and maintenance man as well as those concerned with design and application. For each type of small motor there is an explanation of elementary operating principles, speed-torque characteristics, schematic and detailed diagrams of connections. Information covering testing procedure and equipment, and an extensive trouble diagnosis chart are also included.

Fractional Horsepower Electric Motors, 431 pages, cloth bound, $3.50, McGraw-Hill Book Co., New York, N. Y.

Air Conditioning Data

For those seeking information on the latest practices and methods in this field, the new edition of "Air Conditioning for Comfort" supplies a textbook combining experience drawn from engineering work in refrigeration and air conditioning. Methods and practices suggested are those of a successful engineering office as applied in the daily routine. Its contents have been recast to keep pace with rapid changes in this field.

This book comprises twenty chapters, with charts, tables and explanatory drawings of equipment layouts. Beginning with definitions of common terms used in air conditioning, follow-

IT MUST BE RIGHT

smooth sailing with TRIANGLE

TRIANGLE PRODUCTS GO PLACES

specify!

TRIANGLE

Double Bushed Armored

CABLE

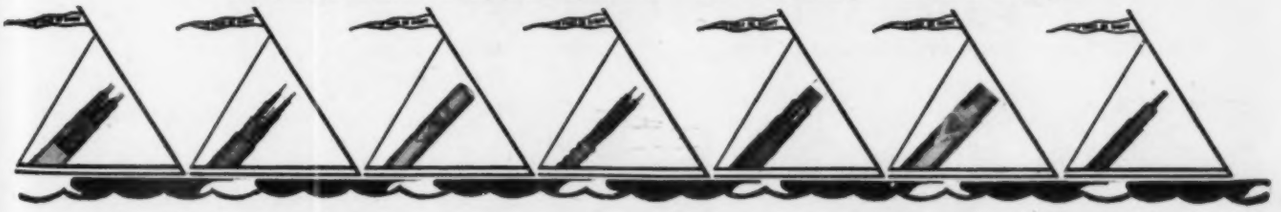
Hot Dip Galvanized Armor!

... Get those words:
HOT DIP GALVANIZED!

The call is for
HOT DIP GALVANIZED!!

Only TRIANGLE gives you
HOT DIP GALVANIZED!!!

TRIANGLE PRODUCTS REWARD BUYERS!



TRIANGLE CONDUIT & CABLE COMPANY, INC.

Horace Harding and Queens Blvds.
Elmhurst, New York City, N. Y.

"THERE!.. THAT'LL KEEP YOU OUT OF TROUBLE!"

The dependability of this long-lasting friction tape is *built in.* It is made of only top quality fabric and adhesives, scientifically treated to retain pliability and to resist the elements. It handles quickly and easily...adheres firmly. A first-class tape for a first-class job.

AMAZON-VICTOR-STICKA
FRICTION TAPE
DISTRIBUTED BY
GraybaR

IN 1869 GRAY & BARTON
70th ANNIVERSARY
GraybaR
ELECTRIC COMPANY
IN 1939 GRAYBAR

OFFICES IN 83 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BLDG., NEW YORK

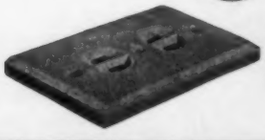
P.S.— STANDS FOR GREATER PERMANENCE & SAFETY!

. . . THAT'S WHY EVERY CONTRACTOR SHOULD PUSH PROFITABLE PORCELETS!

● Those two factors — PERMANENCE and SAFETY — make *Porcelets* easier to sell, especially where hazardous conditions exist. These all-porcelain outlets have — *and will keep* — the superior advantages of being shock-proof, short-proof and fool-proof . . . yet you can offer customers worthwhile savings on the completed job.

"P.P." All-porcelain Systems need never be grounded; require no clamps or connectors; and the same boxes can be used for various types of outlets. Let us send you illustrated data proving Porcelets' simplicity and breadth of their application . . . or, better still, ask your electrical jobber to show them to you!

PORCELAIN PRODUCTS, INC.
FINDLAY OHIO



In the News

[FROM PAGE 80]

ing chapters cover: Fundamentals of heat and air; standards for various parts of an air conditioning system; air conditioning and the human body; psychrometric table and chart; humidity control; heat transmission, ventilation, solar and appliance heat; systems and apparatus; refrigeration, refrigeratants and apparatus; record forms for heating and cooling; air distribution, water, noise and its control; instruments; and a discussion of codes and operating suggestions.

"Air Conditioning for Comfort" by Samuel R. Lewis, Price $2.50, 285 pages, cloth bound. Keeney Publishing Co., 6 North Michigan Ave., Chicago, Ill.

MANUFACTURERS NEWS

U. S. Rubber, Wire Dept. Promotions

Important changes in the executive personnel of the Wire Department, United States Rubber Company, are announced by C. W. Higbee, Manager, Wire Sales.

M. P. Lewis, former Eastern District Manager, Wire Sales, has been appointed assistant manager, Wire Sales Department, with headquarters at the Company's main office, 1790 Broadway, New York City.

H. H. Weber, assistant manager, Wire Sales Department, since 1934, becomes commercial engineer of that department.

H. J. MacDonald, succeeds Mr. Lewis as manager, Wire Sales, for the Eastern District, embracing the Boston, Philadelphia, New York, Pittsburgh, Detroit, Cleveland, Buffalo, and Syracuse Branches. He has handled wire sales in the New England territory for the past 18 years, and continues his headquarters at the Boston Office.

C. W. Short has been appointed to the post formerly held by Mr. MacDonald. For the past two years he was development manager at the Bristol Plant.

G.E. Personnel Changes

R. M. Alvord, J. E. N. Hume and A. S. Moody were appointed commercial vice-presidents of the General Electric Company, at a meeting of the board of directors. Mr. Alvord is manager of G.E.'s Pacific District; Mr. Hume manager of the Industrial Department and Mr. Moody manager of the Northwest District.

Charles F. Scott, assistant manager of the transportation department for the New York District, has been appointed manager of that department.

H. V. Erben, who has been manager of the Switchgear sales division at the Philadelphia works, has been appointed an assistant manager of the Central Station department at Schenectady. Mr. Erben is succeeded in Philadelphia by R. F. Tinnerholm.

Hugh H. Eby, Inc. has recently moved its factory and main office to a newly purchased building at 4700 Stenton Avenue, Philadelphia.

Take a Look!

HERE ARE THE FACTS ABOUT FAN PROFITS!

Don't commit yourself to any line of fans for 1939 until you have seen the new G-E BRASS TACKS Fan Portfolio! It's crammed with facts about fan profits that make mighty interesting and helpful reading!

The salesman of your local General Electric Fan Distributor will be around shortly to show you his copy of this unique portfolio. Watch for him—listen to him—and profit by his sound advice!

GENERAL ELECTRIC

Badger

Synchronous
ELECTRIC
TIME
SWITCH

For Real Profit

$ $ $ $ $ $

Complete dependability in operation is the quality that makes these Badger time switches really profitable for you. Wire 'em and forget 'em—they will give years of satisfactory service.

The complete Reliance line includes the BADGER, RELIANCE, RACINE and the MODEL W RELIANCE—a time switch for nearly every application. Write for full information.

RELIANCE AUTOMATIC LIGHTING COMPANY
1937 MEAD STREET
RACINE, WISCONSIN

For A. C. loads up to 50 amperes. Furnished in single and double pole types and in either cast iron or sheet steel cases. $18.00 and up. Underwriters' Laboratories approved.

★

MINERALLAC HANGER

Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

MINERALLAC JIFFY CLIP

Sizes from .250" O.D. Tubing to 1 1/4" conduit.

See your Jobber

New York City Office
Theodore B. Dally
50 Church Street

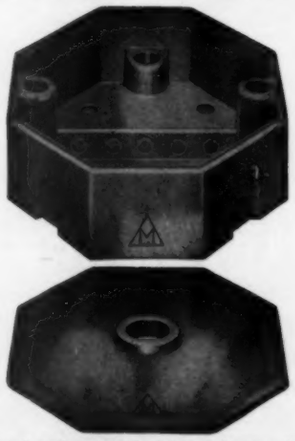
MINERALLAC ELECTRIC CO.
25 N. Peoria St., CHICAGO

Profit by USING

ILLINOIS

Dependable Porcelain

OUTLET BOXES



★Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILL.

In the News

[FROM PAGE 82]

Graybar Organization Changes

The branch house at Butte, Montana, will be transferred from the Seattle District to the San Francisco District, as a sub-branch of Salt Lake City.

The branch house at New Orleans, La., formerly in Atlanta district, will be transferred to the Southwestern District, reporting to the Southwestern District manager at Dallas.

The branch house at Knoxville, Tenn., formerly in the Cincinnati District, will be transferred to the Southern District, reporting to the Southern District manager at Atlanta.

Connecticut Telephone & Electric Corp. has opened an office in the Builders' Building, 228 North LaSalle Street, Chicago. Paul Josepher is in charge of the Chicago office.

The Roller-Smith Company announces the consolidation of its executive offices in New York, with its factory at Bethlehem, Pa. The District Sales Agencies in New York City and in all principal cities in the United States and Canada are not affected.

Allen-Bradley Company of Milwaukee has opened a sales office at 101 Broadway, Rockford, Ill., to serve the Rockford and adjacent Tri-Cities territory. H. L. O'Donnell, formerly of the Chicago office, has been placed in charge.

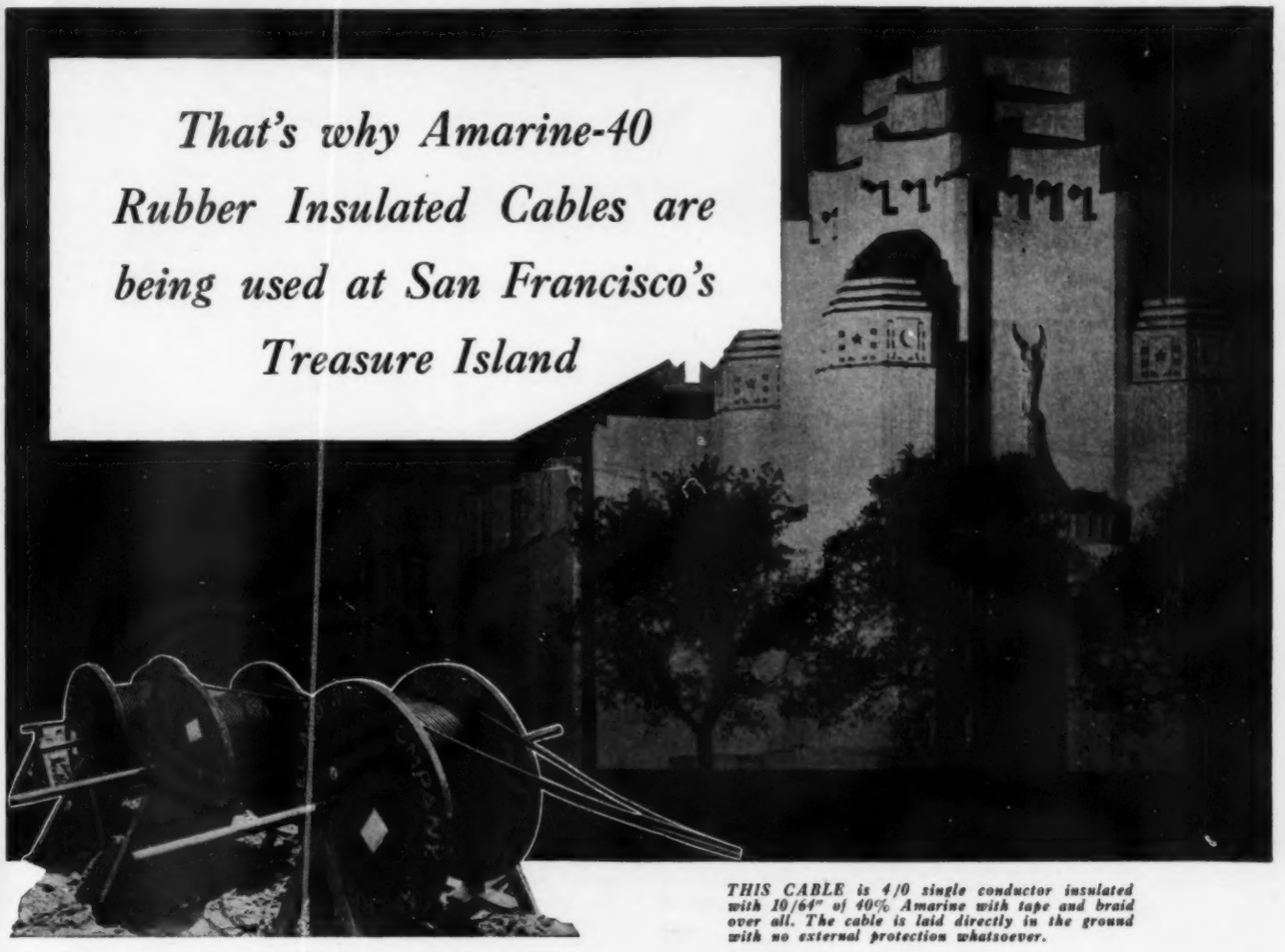
Sterling Electric Motors, Inc. of Los Angeles, have temporarily opened a direct factory office at 81 San Miguel Street, Springfield, Mass. Allen A. Adams, treasurer and director of the company, will act as eastern manager.

Illinois Electric Porcelain Co. of Cacomb, Ill., has appointed the V. G. Christiansen Sales Co., 1107 Farnam St., Omaha, as its agent in the states of Iowa and Nebraska.

Triangle Conduit & Cable Co., Inc. of New York City announces the appointment of Andrew C. Tomb to its sales organization. Mr. Tomb will operate in the states of Ohio and West Virginia and will be under the direction of the Droll Electrical Sales Co. of Detroit. His headquarters will be 77 E. Dickson Street, Mansfield, Ohio.

Lovely to Look at . . . but

A MIGHTY TOUGH SPOT FOR BURIED CABLES



THIS CABLE is 4/0 single conductor insulated with 10/64" of 40% Amarine with tape and braid over all. The cable is laid directly in the ground with no external protection whatsoever.

TREASURE ISLAND, the site of the GOLDEN GATE International Exposition is "made land." This beautiful spot was literally pumped up from the bottom of the sea. The soil which composes Treasure Island contains quantities of salt and other deleterious substances. Where could one find a spot that offered tougher conditions for cables to resist?

The Engineers of the Golden Gate International Exposition thoroughly investigated rubber insulating compounds for use in their buried feeders which must supply the various buildings and equipment on Treasure Island. The result was that they specified Amarine 40 or its equivalent and purchased a large quantity for this service.

Amarine-40 is an insulating compound designed especially for cables operating under water without protection of lead or other water-proof coverings. Its outstanding characteristics are low water absorption, low specific inductive capacity, good aging qualities and high insulation resistance. Amarine compound is still serving in some of the earliest installations of non-leaded submarine cable. Its excellent properties were the reasons for the Exposition Engineers' decision to use Amarine-40 for this severe service.

AMERICAN STEEL & WIRE COMPANY

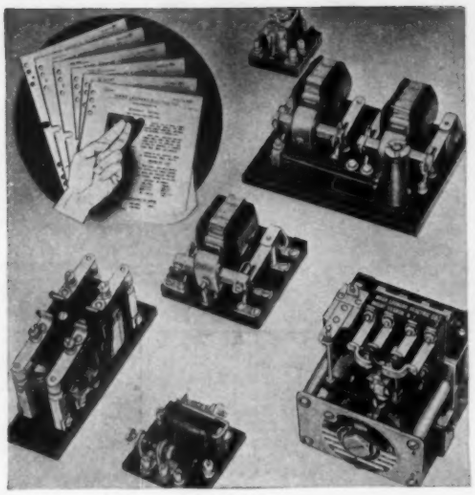
Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Send for this

RELAY DATA



Describing midget, intermediate, and heavy duty, sensitive type, time delay and motor driven relays in all contact combinations.

WARD LEONARD ELECTRIC COMPANY

28 South Street, Mount Vernon, N. Y.

Electric Controls Since 1892

WIRE JOINTS WITHOUT SOLDER!

Less Expense **IDEAL** *Greater Safety*

CONVENIENT TO USE!

IDEAL "Thread-on" Wire Connectors, for *solid* or *stranded* wires, are accepted as standard by the electrical industry. They make uniform, perfect connections—*without solder, tape or hazardous open flame.*

Just screw on. No twisting of wires necessary.

This modern way for making wire joints gets the wiring jobs—because the work is neater and cleaner, and *no scorched ceilings* or *walls* are left after the job is done ! !

The Connector is screwed on just like a nut on a bolt, pressing clean threads into the wires, forming a joint that is *better electrically, stronger mechanically.*

Available in a variety of sizes for joining from 2 No. 20 to 3 No. 10 wires.

FULLY APPROVED—*Listed by Underwriters' Laboratories, Inc.*

SAMPLES UPON REQUEST.

ELECTRICAL PRODUCTS DIVISION

IDEAL COMMUTATOR DRESSER COMPANY

1041 Park Avenue Sycamore, Illinois

In the News

[FROM PAGE 84]

Paragon Electric Co. of Chicago has divided its Missouri Valley territory. Iowa, Nebraska and South Dakota will be covered by Conrad R. Bangh, 503 Sunderland Bldg., Omaha, Neb. Western Missouri and Kansas will be in charge of Thos. Moore, 203 Mutual Bldg., Kansas City, Mo.

Duro-Test Corporation of North Bergen, N. J., has announced the appointment of Franklin Clark as assistant electrical engineer. He was formerly with the Westinghouse Electric & Mfg. Co.

Allis-Chalmers Manufacturing Company of Milwaukee, Wis. recently opened a new branch office and warehouse in the Industrial Office Building, 1060 Broad St., Newark, N. J. C. A. Pihl has been appointed as manager of this branch and is under the jurisdiction of the New York district office.

American Transformer Co. of Newark, N. J., has announced the appointment of the Federal Engineering Company of Washington, D. C., as its representative in that territory.

Westinghouse Electric & Manufacturing Co. has appointed Adolph Frankel as sales manager of special products of the Westinghouse Lamp Division. He will make his headquarters at the Bloomfield, N. J., plant.

Goodrich Electric Company of Chicago announces the appointment of the M. J. Cleary Company, manufacturer's agents, to handle its line in the St. Louis territory, which includes the eastern half of Missouri, Arkansas and southern part of Illinois. The M. J. Cleary Company is located at 317 N. Eleventh St., St. Louis.

Cutler-Hammer, Inc. announces the promotions of E. W. Seeger to chief engineer and P. B. Harwood to assistant chief engineer. Prior to their advancements, Mr. Seeger was assistant chief engineer and Mr. Harwood was general engineering supervisor.

Independent Pneumatic Tool Company elected Neil C. Hurley, Jr. a vice president at a special meeting of the board of directors. Mr. Hurley has been secretary of the company for the past four years.

More Gossip

Sweet Music

Music and modernization in one order recently fell to the Lantz Electric Co. of Orlando, Fla. A northerner who liked the town's winter climate, bought a home there and had a $250 re-wiring job done. The music? Seems the new owner's hobby is organ music, so this home was equipped with a small electric organ.

EXPOSITION CHIEF—*Wm. R. Bokkelen, chief of the division of electricity for the Golden Gate International Exposition has helped put together a new version of "Treasure Island," as the site has been named. Teeming with outdoor electrical effects, the extensive use of fluorescent tube lighting will provide new impetus to outdoor decorative illumination possibilities.*

Merchandising De Luxe

To H. H. Mandly of Hartford goes the distinction of installing what is said to be the largest number of flush built-in lighting units for a department store. In wiring the 12-story addition of the G. Fox & Co. store in Hartford, there were 3,000 one- two- and three-gang flush fixtures. For special demonstrations and displays, this store has prepared a deluxe stage and auditorium for which the wiring and controls will run upward of $50,000.

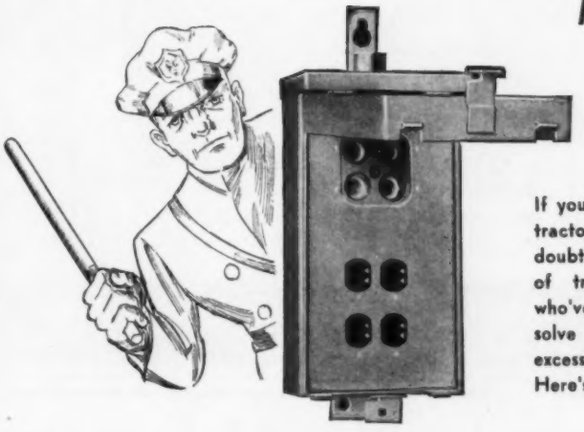
Engine To You

They may look like motors to you but they are "dental engines" to the dentist. So the motor specialist must know and use these terms if he wants this highly specialized type of repair work, says Walter Hendricks of the Hendricks Electric Motor Service of Peoria, Ill.

The complex electrical gadgets of the dental and medical professions are precision jobs and demand precision work by the repair shop. Professional men are glad to have local repair shops to take care of their equipment as their only other recourse is expensive factory returns. The motor shop that talks their language gets their confidence and their business.

RECOMMEND
A Trailer Camp Current
"Policeman" that's FOOLPROOF

The WALKER
Tamper-proof
Plug-in Box



If you're an electrical contractor or jobber, you've doubtless talked to scores of trailer camp owners who've asked you to help solve their problem of excessive use of current. Here's a *positive* solution!

These inexpensive, weatherproof metal boxes are designed so plug fuses and convenience outlets may be padlocked to prevent tampering. After the plug, attached to trailer extension cord, is inserted, the cord is placed in groove in bottom of box, and box is then locked, protecting owner against excessive use of current and limiting user to any amount of current camp owner specifies. Amount of current is controlled by capacity of fuse. Panel illustrated is for 4 plug fuses. Others available up to ten.

Your WALKER Aids—and how they're made:

- Lighting Panels
- Service Switches
- Cutout and Junction Boxes
- Steel and Aluminum Cabinets of All Kinds
- Extra heavy gauge metal
- Plenty of wiring space
- Durable finish
- Streamlined design

WECO ATLANTA

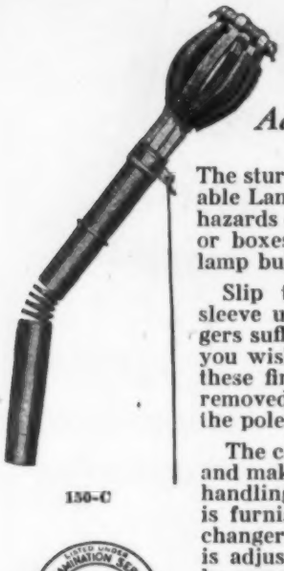
Walker Manufactures Items to ANY Specification—Simply Tell Us Your Problem. Send for Catalog Today!

WALKER
ELECTRICAL COMPANY
ATLANTA, GEORGIA

Eliminate Hazards with . . .

McGILL

Adaptable Lamp Changers



150-C

151-C

152-C

The sturdy, inexpensive McGILL Adaptable Lamp Changer does away with the hazards of falling off stepladders, chairs or boxes while removing or inserting lamp bulbs.

Slip the prong or finger-adjusting sleeve up over the rubber-covered fingers sufficiently to grip the size of lamp you wish to handle. Then by pressing these fingers over the lamp it may be removed or inserted simply by turning the pole.

The coil spring grips the lamp tightly and makes for much quicker and easier handling of the bulb. A flexible joint is furnished for the smaller size lamp changer. By pulling the cord the head is adjusted to any angle so lamps can be removed from or inserted in sockets in almost any position.

Pole sections are 5½ feet long and fasten together with a locking arrangement to make any length pole up to 30 feet.

McGILL MANUFACTURING COMPANY
Box 670, Valparaiso, Indiana

How to wind alternating-current motor coils—

Look up in this book—

—Table of inches occupied by double-cotton-covered wires laid side by side;
—Rules for pulled coils;
—Table of thickness of additional insulation for different voltages per twin;
—Model form for recording complete coil and armature winding data;
—How to remedy troubles due to bulging;
—The four ways of bringing out the leads of pulled coils that are wound straight up;
—Table of insulation data for concentric-chain coils;
—Table of comparative strength of glass, cotton and asbestos tapes.

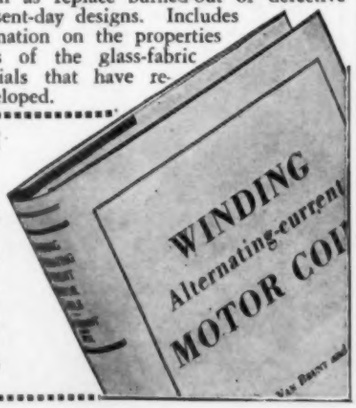
Just Out!

Winding A-C Motor Coils

By G. A. VAN BRUNT and A. C. ROE

281 pages, 270 illustrations, $3.00

This book presents as simply as possible practical information that will enable engineers and repairmen to modernize older types of alternating-current motors and generators by redesigning and rebuilding their windings as well as replace burned-out or defective windings in present-day designs. Includes the latest information on the properties and applications of the glass-fabric insulating materials that have recently been developed.



SEND THIS ON-APPROVAL COUPON

McGraw-Hill Book Co., 330 W. 42nd St., N. Y.

Send me Van Brunt and Roe's Winding A-C Motor Coils for 10 days' examination on approval. In 10 days I will send $3.00, plus few cents postage, or return book postpaid. (We pay postage on orders accompanied by remittance.)

Name .....

Address .....

City and State .....

Position .....

Company E.C.2-39

(Books sent on approval in U. S. and Canada only.)

Leading in Quaker State

With a $65,000,000 public construction program going on in Pennsylvania there is quite a race on among electrical contractors. The Keystone Engineering Corporation of Reading is out in front at the present with about $800,000 in wiring contracts for schools, hospitals, armories and the like. Yale Evelev predicts busy days for the three Keystone offices during the next eighteen months.

AT TREASURE ISLAND—*With new things to do in lighting San Francisco's Golden Gate International Exposition A. F. Dickerson (right) of General Electric Co., Schenectady, acted as supervisor of decorative lighting. George Garthorne, assistant electrical engineer in charge of construction for the fair. He must make Treasure Island's effects work.*

Skyline Review

Tampa's skyline shows up quite conspicuously on the Florida West Coast, but to study it in detail one needs but to review the job photos displayed in the R. C. Bigby Electric Co., Inc. offices. Much of Tampa's large building work was done by this company.

Emphasis on Lighting

Chicago contractor Ed Wigdahl of the Wigdahl Electric Company has developed quite a specialty in lighting jobs. Every contract he takes gets a close scrutiny of the lighting plan and specifications. When the nature of the job indicates that improvements in the lighting methods are possible, he dates up the architect and the owner for a visit to the Chicago Lighting Institute display rooms and some heavy selling on the latest ideas in lighting units and light sources.

First principles, according to Mr. Wigdahl, are to find out just what the lighting is for and then to apply the most modern lighting units and light sources available to the job. Modern lighting automatically demands modern wiring methods.

Now an Electrical Bed

Home comfort ideas put J. Frank Hasenkamp of Chattanooga into the recent columns of the magazine "Life". His "electrical butler-bed" was featured because of its many built-in gadgets. Mr. Hasenkamp is proprietor of the Allied Electric Co.

Two built-in loud speakers are installed at the head of this bed, one for radio the other for sleep producing music or for two-way front door talking. Switches control lights, windows and fan. Lights, clock, telephone and radio are built in. The radio shuts off automatically after sleep has come and the alarm clock rings until the sleeper gets out of bed. Getting back into bed within 30 minutes automatically starts the alarm ringing again. (That's a cruel one!) Other automatic controls turn off the reading light after the occupant has fallen asleep. The windows open or close according to temperature.

Now what next?

HEADS PHILADELPHIA ASSOCIATION—*A. L. Hallstrom, Atlantic district manager of Graybar Electric Co., Inc., was elected president of The Electrical Association of Philadelphia for 1939. Other officers elected—Howard Miller, vice president; Philip H. Ward, Jr., treasurer; and Robert J. Moran, secretary.*

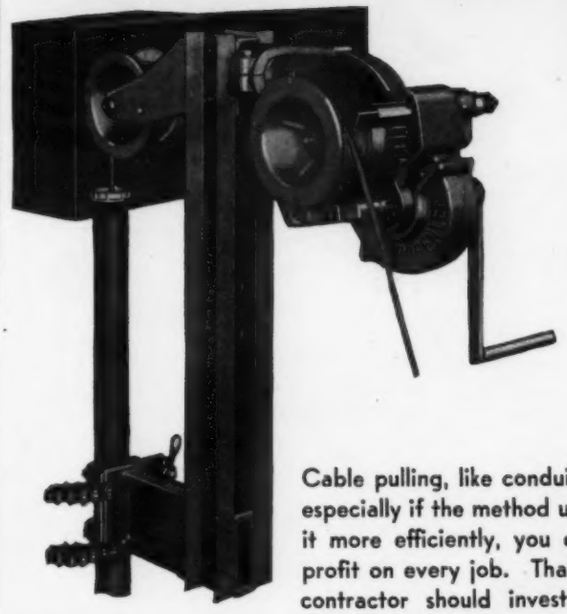
Attic Weather Market

The south has found that attic cooling fans bring real relief, so big things are being done to curb midsummer madness. Recently 304 attic fan units were installed to cool company-owned homes for the Texas Gulf Sulphur Co., in the town of Newgulf, Texas. It just goes to show that it pays to look for business high and low.

Unusual Maintenance Contract

The city of Miami Beach, Florida, depends on an electrical contractor's maintenance staff to keep its police and fire alarm and traffic control systems in working trim. The Lyon Electric Company has trained its men to handle this type of work so well that the city has left it up to them.

Efficient Cable Pulling
ADDS TO PROFITS ON EVERY JOB



GREENLEE
Cable Puller
PORTABLE
POWERFUL
CONVENIENT

Cable pulling, like conduit bending, is expensive,—especially if the method used is obsolete. If you do it more efficiently, you cut costs and add to the profit on every job. That is why every progressive contractor should investigate the new Greenlee Puller shown above.

Here is a tool that is in a class with Greenlee Hydraulic Conduit Benders as a time and labor-saving device. It is easily clamped right to the conduit through which cable is to be pulled, preventing the loosening of hangers. The drum can also be used as an ordinary winch, since it is detachable and has a base provided on it for bolting to a plank. It weighs only 170 pounds, has two speeds, and will exert a pull of 7500 pounds.

Do You Have a Copy of Catalog 31E?

If you have a copy of the Greenlee Tool Catalog, No. 31E, turn to page 32 for a description of this new cable puller. If you haven't a copy, ask for one now. This catalog also includes Hydraulic Conduit Benders, Knockout Punches and Cutters, Joist Borers, Spiral Screw Drivers, Automatic Push Drills, Electricians' Bits, Bit Extensions, Hydraulic Pipe Pushers, and Copper Tube Benders.

GREENLEE TOOL CO.
ROCKFORD, ILLINOIS

GREENLEE TOOL CO., Rockford, Ill.
☐ Please send information on your Cable Puller.
☐ Would like to have a copy of Catalog No. 31E.
Name.....
Address.....
City..... State.....
My Jobber is.....
.....EC 2-37

EQUIPMENT News

Bus Support

Recent improvements have been made in the design of bus support (type UH). Features are—interlocking teeth have been provided on neck of device, permitting tubular bus to be set at angle to steel structure. Finer adjustments than are obtainable through use of interlocking teeth may be made by means of slightly ovalized bolt holes in base. Tube clamping members are so arranged that either a tight fit or slide fit may be obtained, according to requirements. Burndy Engineering Co., Inc., 459 East 133d Street, New York.

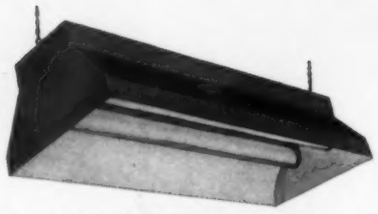
BURNDY BUS SUPPORT

■

Fluorescent Lamp Diffuser

A new line of lighting units, known as Daylight fluorescent lamp diffusers, with numerous industrial and commercial applications. A minimum of 100 foot candles of daylight quality light of 6,500 degrees Kelvin color temperature rating, can be distributed over an area 3 feet by 4 feet when a 36-inch lamp unit is suspended 30 to 36 inches above surface. Each unit is arranged for three lamps. The 36-inch size uses 30-watt (T-8) lamps providing 36 lumens per watt and the 18-inch size uses 15-watt lamps rated 30 lumens per watt. Auxiliaries are built into these units. Benjamin Electric Mfg. Co., Des Plaines, Ill.

BENJAMIN LIGHTING UNIT

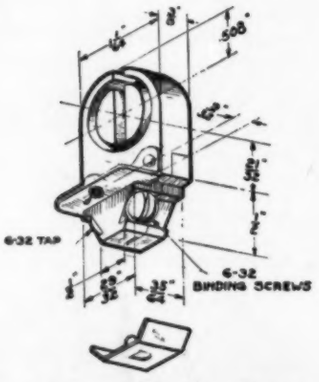


KELLEY FLUORESCENT UNIT

Fluorescent Unit

Nurescent fixtures for fluorescent tubes in industrial lighting, especially for inspection tables, color matching machines and drawing boards. Made in sizes to take fluorescent tubes from 18 to 36 inches. Go in end to end to form continuous inverted trough complete with auxiliaries, lampholders, reflecting plate and fixture loops. Now finished in double baked porcelain enamel with egg shell finish. Frank Kelley, Inc., Elkins Park, Pennsylvania.

■



G. E. FLUORESCENT LAMPHOLDER

Fluorescent Lampholder

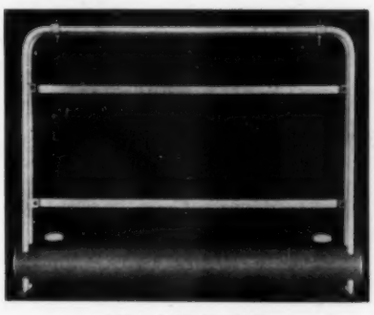
A new fluorescent lampholder designed for use with one-inch fluorescent lamps in showcase lighting, ceiling fixtures, etc. It is for flush mounting. Wiring is protected through use of a sheet Textolite cover plate. One-screw mounting provides easy and rapid assembly, and contact is established and lamp held firmly by a 90-deg. rotating lock. Lamp can be removed from holder by reversing 90-deg. turn until double contacts of lamp are lined with lampholder slots. Available in black or white Textolite. General Electric Co., Bridgeport, Conn.

WESTINGHOUSE HEAVY DUTY PUSH BUTTON

Push-Button

Push-button for a.c. and d.c. control circuits designed for heavy duty service. Eight different units including lamp receptacle and rotary selective switches may be grouped together in desired combinations. All units have interchangeable mounting dimensions and are suitable for built-in controls or panel mounting. Features include heavily silver plated, double break contacts, stainless steel springs and heavy duty design. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

■



SOLA SIGN-FORMER

Neon Transformer

A new transformer, known as Sign-Former, is for users and makers of point-of-sale neon signs. Incorporates in one unit both a cylindrical transformer core and a framework of metal tubing for support of neon tubes. Can be used either as a hanging or standing sign. Construction permits complete sign assembly before shipment, and sign can be installed by user by plugging it in electrical outlet. Unit is 17½ inches high; 24 inches long and 2¾ inches deep. Sola Electric Co., 2525 Clybourn Ave., Chicago, Ill.

■

Motor

A new split phase ⅛ h.p. motor adapted for vertical mounting, and for a variety of applications. Constructed for continuous duty, having special bearing design which provides for lubricant circulation and utilizes filtering advantage of feed wick. Semi-enclosed, with inbuilt air circulator

to insure adequate cooling, this motor is quiet both in starting and operation. Has a high starting and pull out torque and thermal overload switch. Has dynamic balanced rotor parts and electric welded rotor connections which eliminate solder. Furnished in modified design for horizontal mounting. Delco Appliance Division of General Motors Sales Corp., Rochester, N. Y.

■

Yard Light

Light for use around barns, cribs, outbuildings and other farm areas. Conforms in design, size and construction with R.E.A. requirements. Equipped with weatherproof porcelain enameled reflector separable shallow dome type. Provides wide spread of light and permits easier wiring and servicing. Hood, socket, and reflector come apart without tools. A resilient socket cushions lamp against vibration and lengthens life of lamp. Furnished complete with 14-inch porcelain enameled reflector, cadmium plated separable hood, ½-in. conduit stem with wall flange and lag screws for mounting. Goodrich Electric Co., 2900 N. Oakley Ave., Chicago, Ill.

GOODRICH YARD LIGHT

■

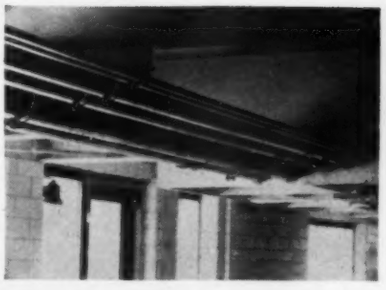
Booster Fan

This new unit was designed for increasing the efficiency of warm air gravity heating systems. Of booster propeller fan type construction, it breaks up air pockets in furnace and provides distribution of air by forcing circulation through pipes. Gives quicker and more positive recirculation of air through house and helps eliminate cold floors. Designed for installation at the base of cold air return duct at point where it contacts the furnace. Forced air action moves heated air out of furnace and distributes it to all rooms. Autovent Fan & Blower Co., 1805 North Kostner Ave., Chicago, Ill.

AUTOVENT BOOSTER FAN

A TRIAL WILL CONVINCE YOU!

THERE'S MORE MONEY IN EVERY WIRING JOB *when you use* CLEVELAND CONDUIT HANGER!



● The proof of the pudding, somebody said, is in the eating . . . so we want you figuratively to "sink your teeth" into an actual CLEVELAND CONDUIT HANGER installation and experience, first hand, the greater ease of handling, the neater appearance, and the greater flexibility provided by this revolutionary new device. Other contractors have told us it isn't at all hard to take . . . and we know that you, too, will find it a particularly juicy morsel from the standpoint of the wider profit margin it makes possible.

The CLEVELAND CONDUIT HANGER has many unique features that you'll welcome on every wiring job. Fewer units to handle; enables you to pre-assemble conduit for better alignment and hang parallel groups on one line . . . vertically, horizontally, or diagonally.

Study these three views . . . see how much *neater* they look; how much more *rigidly* the conduit hangs; how much *easier* it must have been to make the installation with rails and clamps all set up, ready to receive the conduit with but one screw to tighten on each clamp. Accommodating various sizes of conduit on a single rail, and permitting suspension or fastening direct to beams, you've got the most flexible layout you could ask for.

Cleveland conduit hanging equipment gives you everything you need . . . channels, rails and clamps . . . and there are *no extras!* Sounds good? Let us send you all the details!

Write Today . . .

for full information on this innovation in conduit hanging . . . and its economical, efficient use in making your work more profitable!

THE CLEVELAND SWITCHBOARD CO.

2927 EAST 79th STREET CLEVELAND, OHIO

NO MORE

- CROOKED PLATES
- WASTED MOTIONS
- GUESS WORK
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with the

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OUTLET BOX SUPPORT & ELECTRICIAN'S GUIDE

Here's QUICKER, EASIER and LESS COSTLY INSTALLATION. EXAMINE the advantages of this method:

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- Does not interfere with switch screw.
- Box is securely fastened.
- Will not split or bend.
- Boxes same height from floor.
- More gangs can be added later.
- Box can be removed readily.

Send coupon today for full details:—

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42 E. Strand, Kingston, N. Y.

Please send information on the Electrician's Guide and CLIPPER outlet box supports.

Name.....

Address.....

City.....

State.....

My jobber is.....

EQUIPMENT NEWS

[FROM PAGE 91]

Communication Systems

Speaking microphone systems to provide simple conversation between key persons in business office or plant or in the home. Operates on a.c. or d.c., 110 to 220 volts. The two way system is designed for service between two points only. Furnished complete with 50 feet of shielded cable, ready to install. Will operate for a distance of several hundred feet. The Centerphone system is designed for service between one master station and several outlying stations, where outlying stations need not communicate between one and the other. Furnished in portable or flush type. Connecticut Telephone & Electric Corp., Meriden, Conn.

CONNECTICUT CENTERPHONE UNIT

■

Fluorescent Lamp

A 100-watt fluorescent lamp for general industrial lighting with a tubular light source, 4-ft. in effective length. Uses a high efficiency fluorescent material as inside coating of tube. Ultra violet radiations produced in tube are converted by this coating to visible light by means of a high ratio energy transformation. The efficiency of lamp is 50 lumens per watt. General Electric Vapor Lamp Company, Hoboken, N. J.

G. E. FLUORESCENT LAMP

PROOF

Here's proof you can depend on ILSCO Solderless Lugs to grip wires securely — against as much as 480 LBS. PULL!

Capacity of scale used in test: 500 lbs. Lugs used same size as shown below, for #8 to #4 wire range.

Write Dept. EC for samples.

ILSCO COPPER TUBE & PRODUCTS, INC.
5629 Madison Road, Cincinnati, Ohio

VICTOR
"FORCE AIR" EXHAUST FANS

Complete Line 6" to 28"

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Equipped with Victor's Super-Powered Motors

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Rugged Construction

Trouble-free performance

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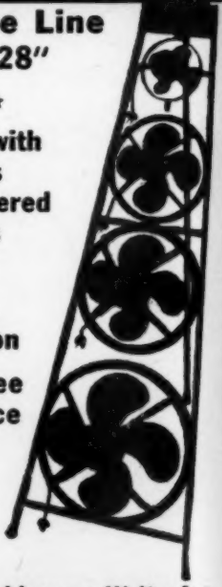
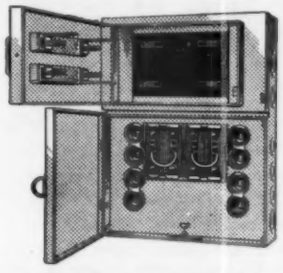


Ask Your Jobber or Write for Catalog to
VICTOR ELECTRIC PRODUCTS, INC.
811 Reading Road Cincinnati, Ohio

Service Entrance Equipment

A 100 ampere capacity switch has been added to this line of door-operated safety switches. Available in 30, 60 and 100 amperes, with and without branch circuits. Door has large grip handle to operate switch. Open door places switch in off position and main fuses are dead and accessible. Switches with branch circuits have an additional door to give access to circuit fuses. Wadsworth Electric Mfg. Co., Inc., Covington, Ky.

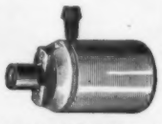


WADSWORTH SAFETY SWITCH

■

Key Socket

A new line of mogul sockets with a switch mechanism for two filament mogul lamps. Sockets have snap switch action and operate high, medium, low, off or low, medium, high, off. Socket bodies supplied without hickeys or with 1-inch hickeys. Separate hickeys available in four different heights. Round turn knob key is removable for assembly in lamps. Arrow-Hart & Hegeman Electric Co., Hartford, Conn.



ARROW-HART & HEGEMAN KEY SOCKET

■

Lighting Fixture

This lighting fixture, designed for high intensity illumination, color matching, and inspection work, contains 80 feet of fluorescent luminous tubing. Colors are arranged and matched to approximate a duplicate of pure sunlight. Available in three sizes, 200 watt and 300 watt consumption. Operates on 110 volt, 60 cycle, single phase, a.c. current. Provides light intensity of 100 foot candles. Suspended with rigid or chain chrome hangers. Replacement tubes easily inserted. Visualite Corp., Lima, Ohio.

VISUALITE LIGHTING FIXTURE

INSTALL

ROME-60

Tough — long wearing — heavy duty

60% jacketed

PORTABLE CORDS

WELDING CABLES

MINING MACHINE CABLES

Designed for maximum flexibility, to resist fracture due to twisting, and with strength to withstand sharp jerks and pulls under torsion.

Send for samples.

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PRODUCTS

Hot rolled rods, bare and tinned copper wire, bare and tinned strand, U.R.C. weatherproof wire, cotton, paper and asbestos magnet wire, rubber insulated wires and cords, lead covered cables.

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FLOOR BOXES AND WIRING SPECIALTIES

No. 285 Double Duplex Receptacle Nozzle

The most attractive, compact and easy-to-install fitting on the market. Shown in illustration with No. 200 Cover Plate.

No. 330 "Latrobe" Tom Thumb Utility Outlet

For use in wood installations, and other locations free from moisture or mechanical injury.

The *Latrobe Line* is complete for all residential, commercial, and industrial requirements. In addition, the entire line is designed with the idea of reducing installation time . . . an important point to consider when selecting floor boxes and wiring specialties.

No. 110 "Latrobe" Watertight Box

Cut-away view showing how tapered unit receptacle fits tapered opening in top of box body. The last word in design, appearance, and simplicity of installation.

FULLMAN MFG. CO.

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NOW- how to repair and rewind all types of motors . . .

ELECTRIC MOTOR REPAIR LIBRARY

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THIS set of books should be on the shelf of every man who ever has to touch a motor for purposes of repairing it or changing it to meet different operating conditions. In shop language and with practical shop methods it covers every step in stripping, rewinding and connecting a.c. and d.c. motors of all kinds.

Do you know how to:

—lay out a wave winding
—test a.c. and d.c. motors to locate grounds, shorts, opens, quickly and positively
—properly record data when stripping armatures so that it will be instantly usable for correct rewinding by yourself or any experienced winder at any time afterward
—determine how many coils can safely be cut out
—lay out single-phase fan motor windings
—change single-phase windings for two- or three-phase operation
—make cross or equalizer connections on lap windings
—lay out frog-leg windings
—handle every step in a rewinding job from the time it comes into the shop until it leaves
—wind stators for tubogenerators
—band high-speed armatures
—rewind motors for voltage, speed, frequency, or cycle changes
—etc., etc., etc.

1,079 pages of practical shop methods and data on jobs like these in this library. A complete, modern key to repair of all motors. Nothing else in it; every page filled with definite, practical facts for the industrial maintenance man and the electric shop worker.

How to change motors for different operating conditions

Here is all the information you need in order to determine what changes various types of motors permit; to lay out new windings for specified service conditions; and to handle every step in the work with satisfactory results.

Covers all types of motors, from those used in small household and commercial appliances of all kinds, to mining and railway motors. Explains principles underlying the different types of winding; gives definite instructions for doing the various rewinding jobs. Also gives many data, tables and diagrams constantly needed by the repair man, including data difficult to get from any other sources.

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EQUIPMENT NEWS

[FROM PAGE 93]

Magnetic Switch

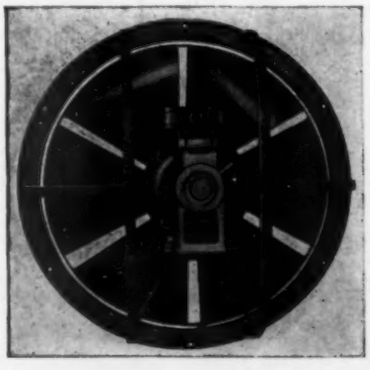
A new a.c. magnetic switch has been developed for full-voltage starting of single-, two-, and three-phase motors. Principal features, in addition to small physical dimensions, are its conservative electrical design, long mechanical life and low maintenance costs over a long period of time. Consists of line contactor, with interlock to provide under voltage protection, and two isothermic temperature overload relays to protect motor against overheating. Open type switch is furnished with rigid mounting plate to permit easy mounting on either an insulating or a conducting panel. General Electric Co., Schenectady, N. Y.

G. E. MAGNETIC SWITCH

■

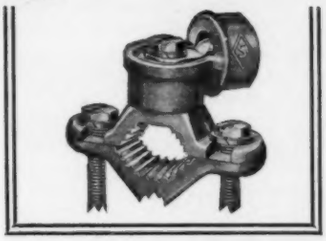
Exhaust Fan

This 24-inch bucket blade exhaust fan is powered by a heavy duty, ball bearing, ½ hp. motor. Frame of steel construction with all joints welded. Steel fan blade formed for maximum efficiency and quietness. Special thrust type ball-bearings permit motor to be mounted in vertical position. Totally enclosed housing protects motor interior from dust, dirt and grease. Single phase a.c. motor has a capacitor type, rubber mounted. Can be furnished single and three phase and direct current. Signal Electric Mfg. Co., Menominee, Mich.



SIGNAL ELECTRIC FAN

GF2



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RIGID GROUND FITTINGS

- **Adjustable to any position**
- **6 types and a variety of sizes**
- **Absolute protection for ground wire connections**
- **Solder or solderless**
- **Pipe clamp may be reversed for use with ground rod or thin wall conduit.**

Contractors can be sure of good, finished jobs and save themselves time, money, and worry with Sherman Rigid Ground Fittings.

Let us send you Bulletin No. 12

H. B. SHERMAN MFG. CO.
BATTLE CREEK, MICH.

A SCREW DRIVER
and a

TWIST

. . . nothing else required to make a perfect joint with

The **MARR CONNECTOR**

Just pick up a post card and say "I'd like to try the MARR." We'll send a sample, FREE. No obligation.

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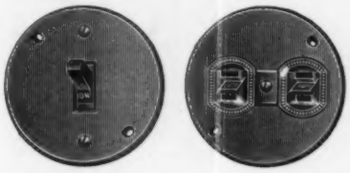
522 STATE STREET
NEW HAVEN, CONN., U. S. A.
GENERAL SALES AGENTS HATHEWAY AND CO.
220 CHURCH STREET NEW YORK, N. Y., U. S. A.

Cover Devices

A new line of bakelite switches and duplex receptacles assembled on bakelite covers for outlet boxes. Switches are available in both single pole and three-way with sturdy, dependable mechanism of residential type. Receptacles are duplex style with parallel slots and covers fit 3¼-in. or 4-in. boxes. Devices are designed for insulated systems or urban work. Arrow-Hart & Hegeman Electric Co., Hartford, Conn.



ARROW-HART & HEGEMAN COVER DEVICES

■

Tube Lamp Transformers

New transformers' Series 727, for luminous tubing used for interior illumination and decoration. Provide the 15,000 volt secondary current required, may be mounted recessed in wall, ceiling or post, or installed on surface. High tension cables are eliminated, electrode housings are recessed and connections to primary are quickly made by means of screw terminals. Knockouts for conduit entrance and adjustable brackets for either surface or recessed mounting. Flush plates available, Jefferson Electric Co., Bellwood, Ill.

JEFFERSON TRANSFORMERS

■

Light-Hood

A Light-Hood for use with silvered bowl lamps has been added to the Curtis line. Designed to produce high intensity uniform light from a large surface with low brightness and a minimum of glare. Recommended for mass production assembly lines, drafting tables, composing rooms, and other places where color or height of ceiling makes it impractical for diffusing purposes. Curtistrip assembly is wired and hung first and then steel hood is attached to it by means of wing nuts. Using 4 200-watt medium screw base standard silvered bowl lamps on 30-inch centers in a 10-foot section of Light-Hood, between 85 and 100 foot candles of light are obtained. Curtis Lighting, Inc., Chicago, Ill.

SQUARE D MULTI-BREAKERS

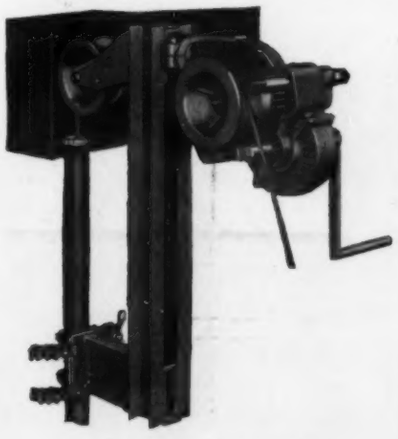
Multi-breaker

A new Type M raintight multi-breaker for outdoor applications of service entrance and auxiliary services. Conduit hubs can be provided in top or bottom or both, in sizes to meet usual requirements. Provision for sealing deadfront trim, which covers wiring gutters and for locking outer cover. Illustration shows device containing one type M unit. Same construction used on devices containing two or three type M units, which make available one to six single pole circuits, one to three double pole circuits or a combination of both. Either grounded or insulated neutral can be furnished. Also neutral can be omitted for range or water heater sub-feeds. Square D company, Detroit, Mich.

■

Cable Puller

This No. 765 cable puller will exert a maximum pull of 7,500 pounds. It has two speeds, through a direct gear and a back gear. A shear pin is provided in back-gear shaft to prevent damage under excessive pull and a dog on back gear prevents unwinding of cable in event of pin shearing. The ⅞-in. square shafts extend from both sides for one or two operators. Two cranks are supplied, but ratchet wrenches can be used. Portable electric power unit can also be used for driving machine. Cable is not furnished with machine. Greenlee Tool Co., Rockford, Ill.



GREENLEE CABLE PULLER

YOU'LL PREFER

SHAWMUT
SHUR-LAG

RENEWABLE

FUSES

FOR A DOZEN REASONS
ASK US WHY

The CHASE-SHAWMUT COMPANY

NEWBURYPORT
MASSACHUSETTS

KNOB & TUBE WIRING

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*See 1938–1939 Buyers' Reference number of Electrical Contracting for additional information on these companies and their products.

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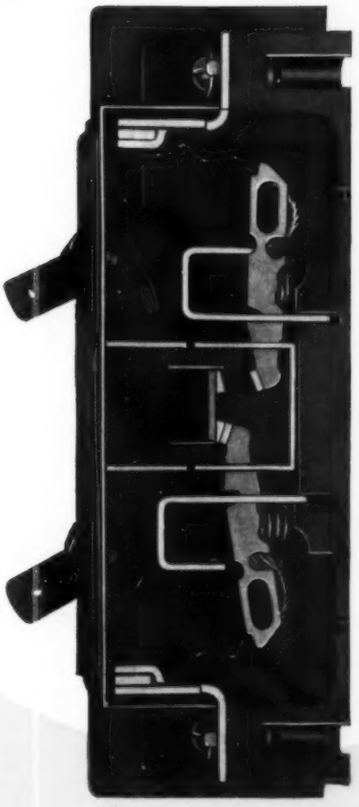
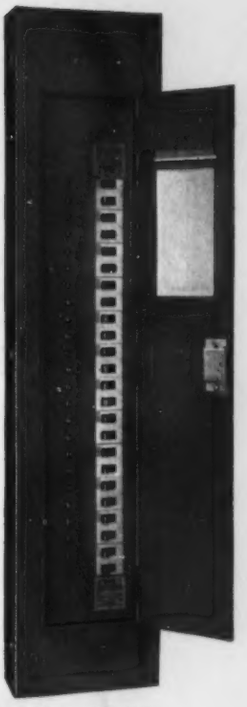
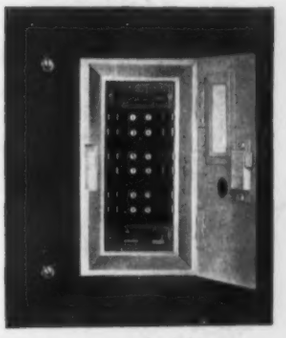
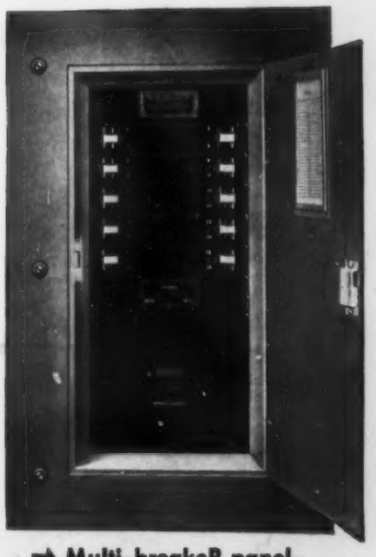




➡ Narrow column Multi-breakeR panelboard.



➡ Multi-breakeR lighting panel.



➡ Multi-breakeR panelboard with main circuit breaker.

➡ **These circuit breaker lighting panels are built from Multi-breakeR units as shown in the center cut-out illustration. The simplicity of the design is the keynote to low cost, long life and trouble-free operation. There are only *three moving parts,* the springs operate under compression, and there are *no bolted or riveted joints* between terminals. By actual test, the operating life of the Square D Multi-breakeR is *many times longer* than ever before attained by a circuit breaker used for similar applications.**

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